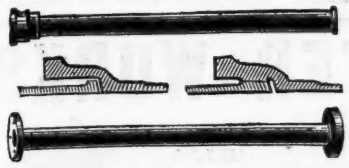
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXV. No. 1666.] LONDON, APRIL 16, 1895. [47TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1½ to 12 IN. BORE.



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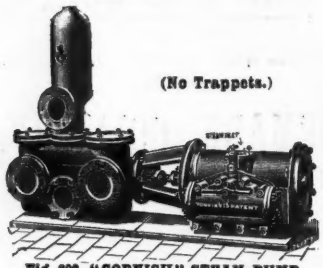

(No Trappets.)

Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

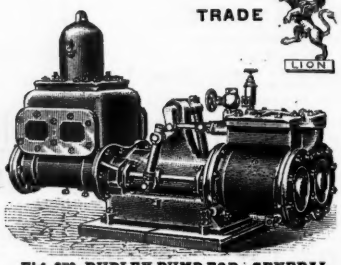

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

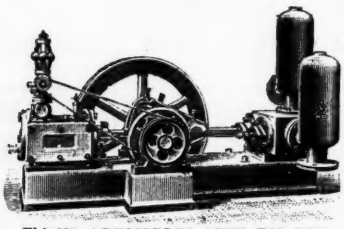

Fig. 685. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

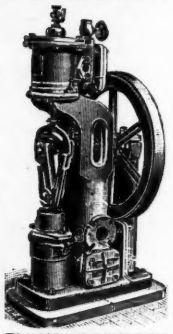

Fig. 705. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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G 870
Cast Unicorn Burner, 5s. per dozen.

THIS STOVE is **invaluable** for **Bedrooms** and **Kitchens. No other Gas-Stove equals it for quickness.** It simply slips over the Burner which is supplied with the Stove, and which thereby is at once converted into an atmospheric burner. When the Burner is not needed for the Stove, it remains in the bracket, and acts as an ordinary Comet Burner. The Kettle has a sunk well, and rests securely on the Stove, **which must always be lighted from the top.**

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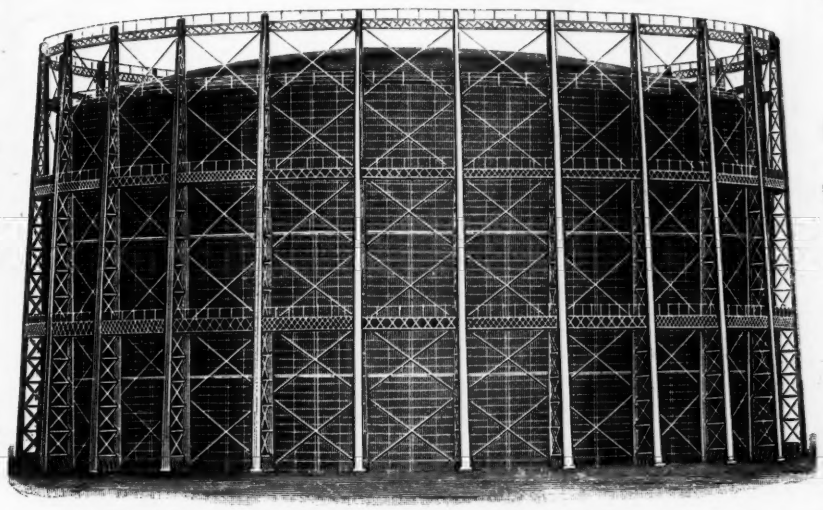

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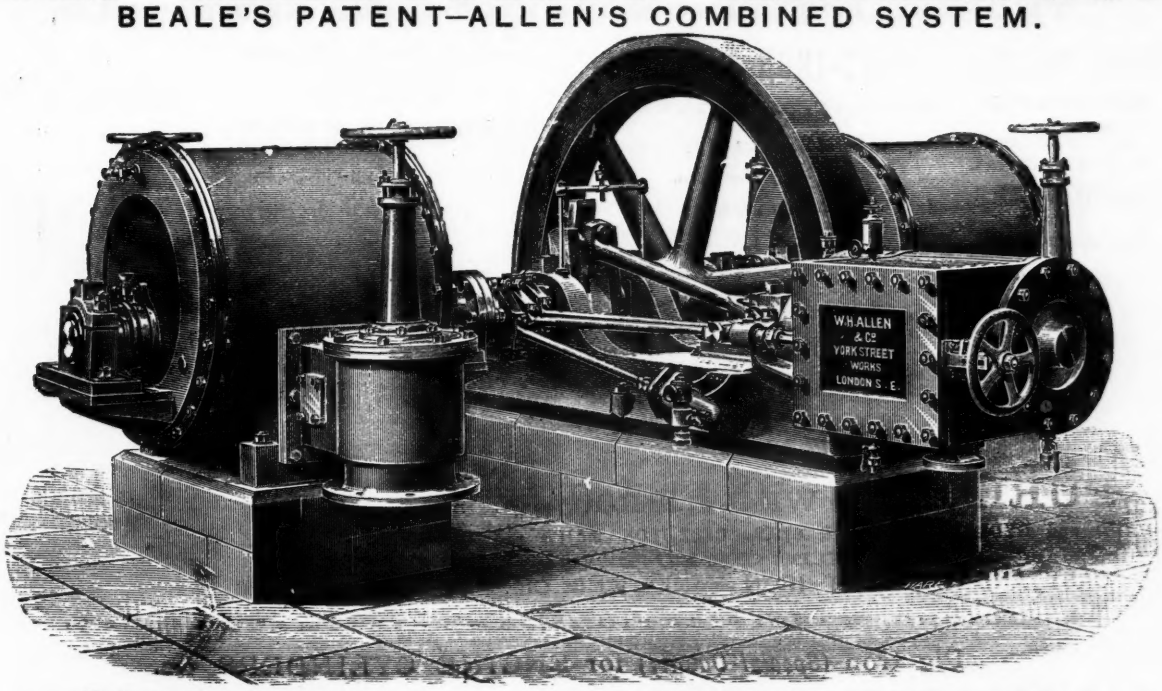

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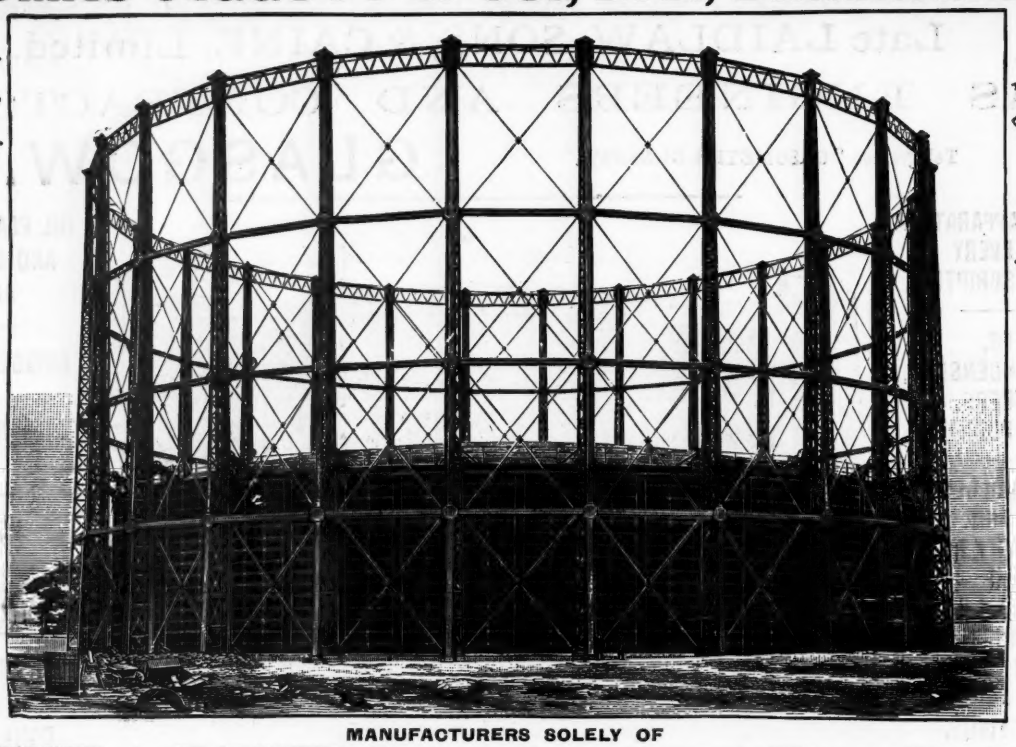

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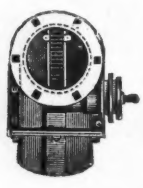

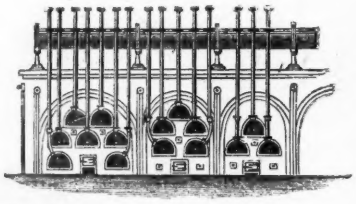

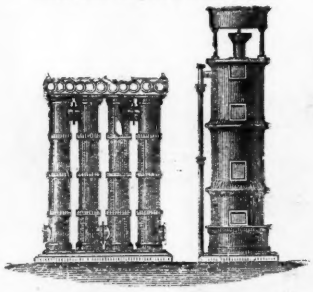

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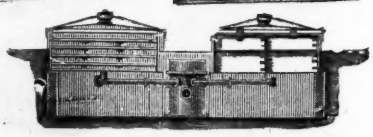

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At the higher price, we claimed with justice that the initial cost of the burner was covered by the saving in gas in twelve months, or less. We can, with equal justice, claim that at the **Reduced Price** this saving is effected in **eight months, or less.**

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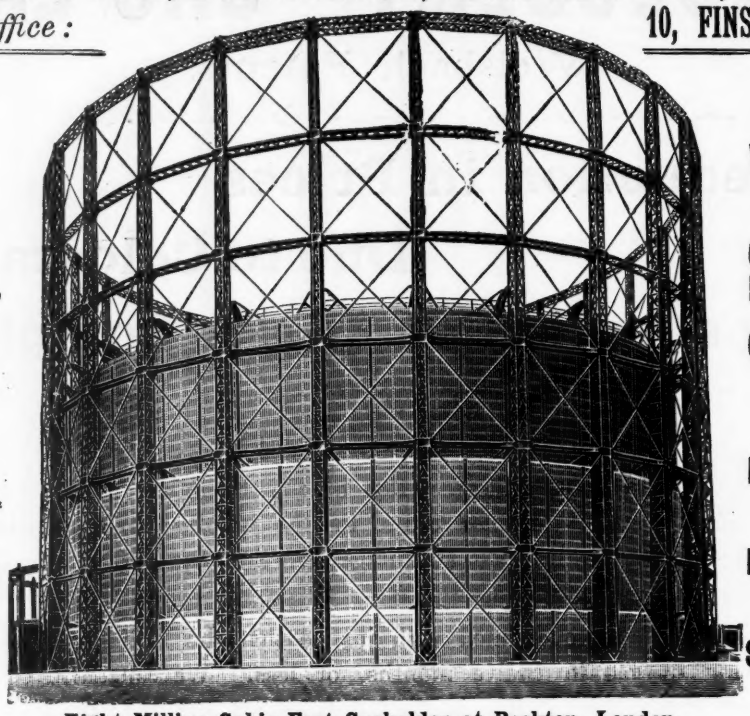

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Entirely fitted together at Makers' Works, before delivery; thus ensuring speedy erection and certainty of effectual working.

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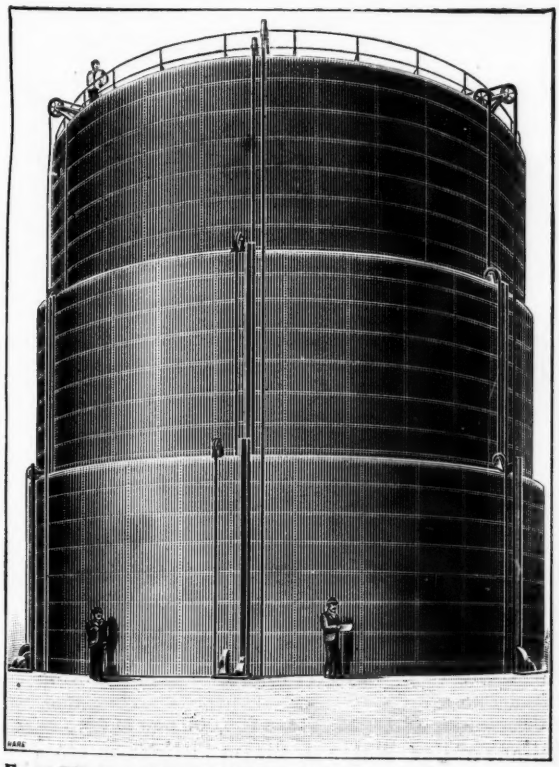

From Photo. of Three-Lift Roped Holder, 50 feet diameter by 18 feet deep each Lift. Erected at Sligo, 1894.

Pease's Patent Roped Gasholders

THESE HOLDERS HAVE WORKED SUCCESSFULLY UNDER EVERY TEST TO WHICH THEY HAVE BEEN SUBJECTED SINCE 1889.

MAY BE SEEN AT MANY PLACES.

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Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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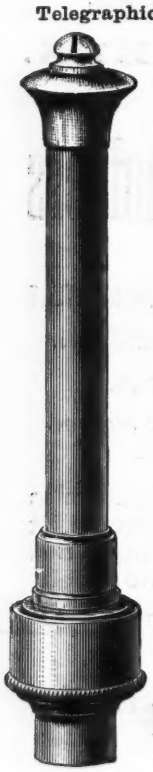

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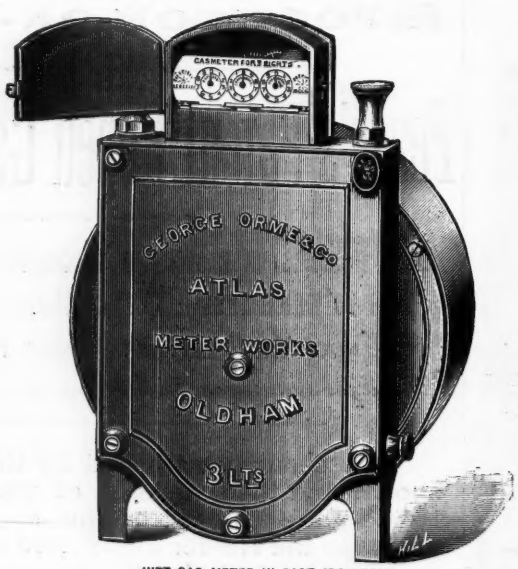

WET GAS-METER IN CAST-IRON CASE.

DRY GAS-METER IN STRONG TIN-PLATE CASE.

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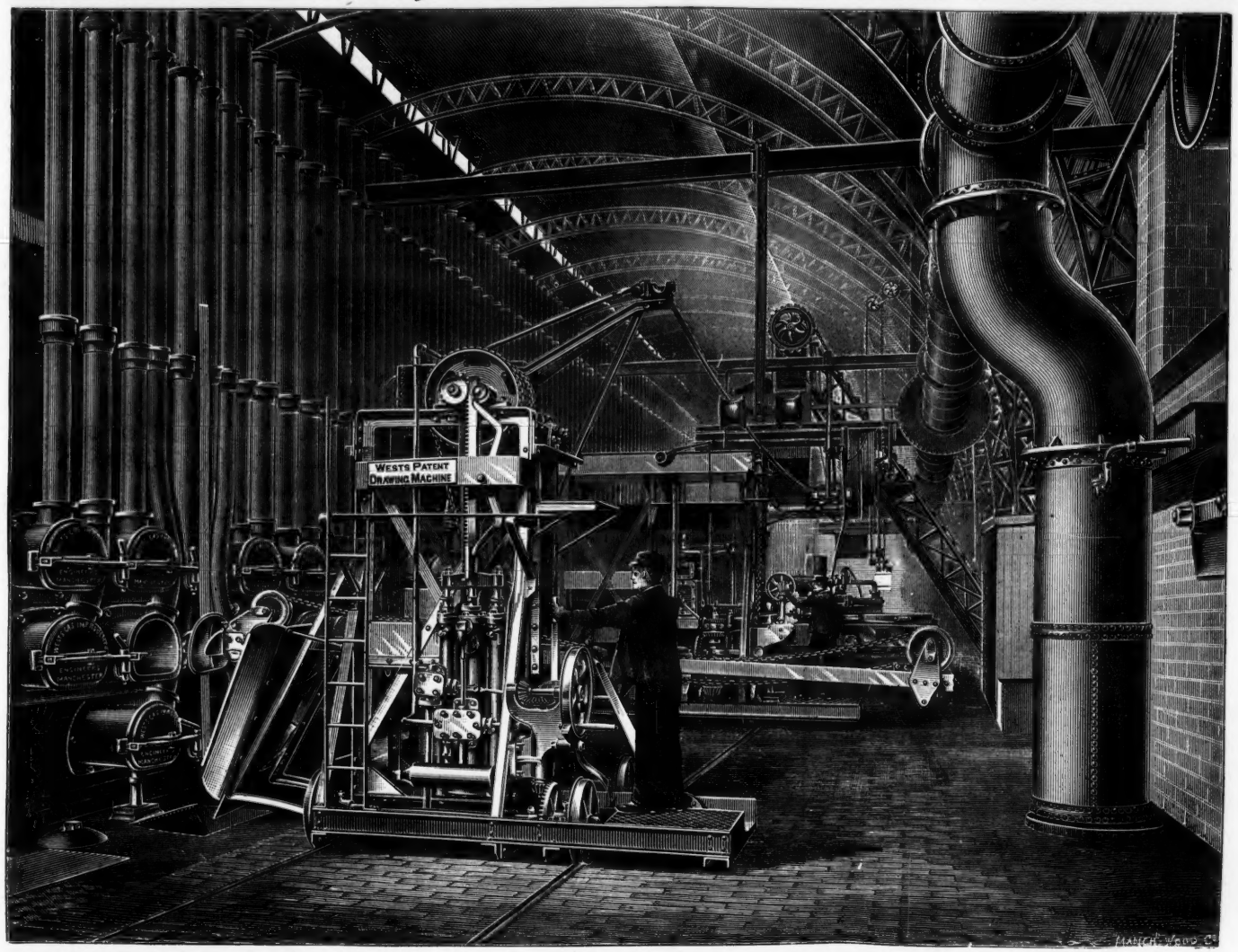

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

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OVER

560,000

LINEAL FEET

OF

RETORTS DAILY

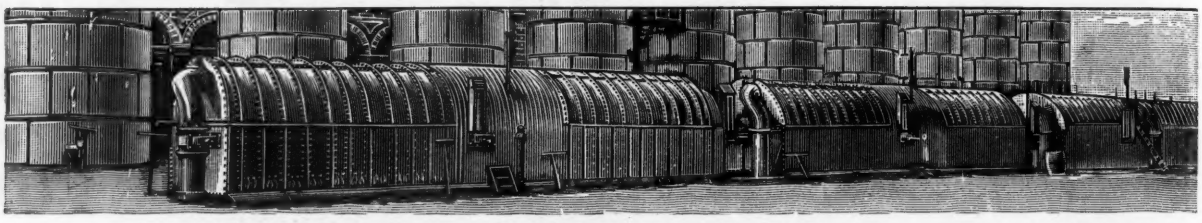
ARE CHARGED AND DRAWN BY

WEST'S MACHINES.

KIRKHAM, HULETT, & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBER

☛ **492** of these Machines (capable of dealing with **472,540,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



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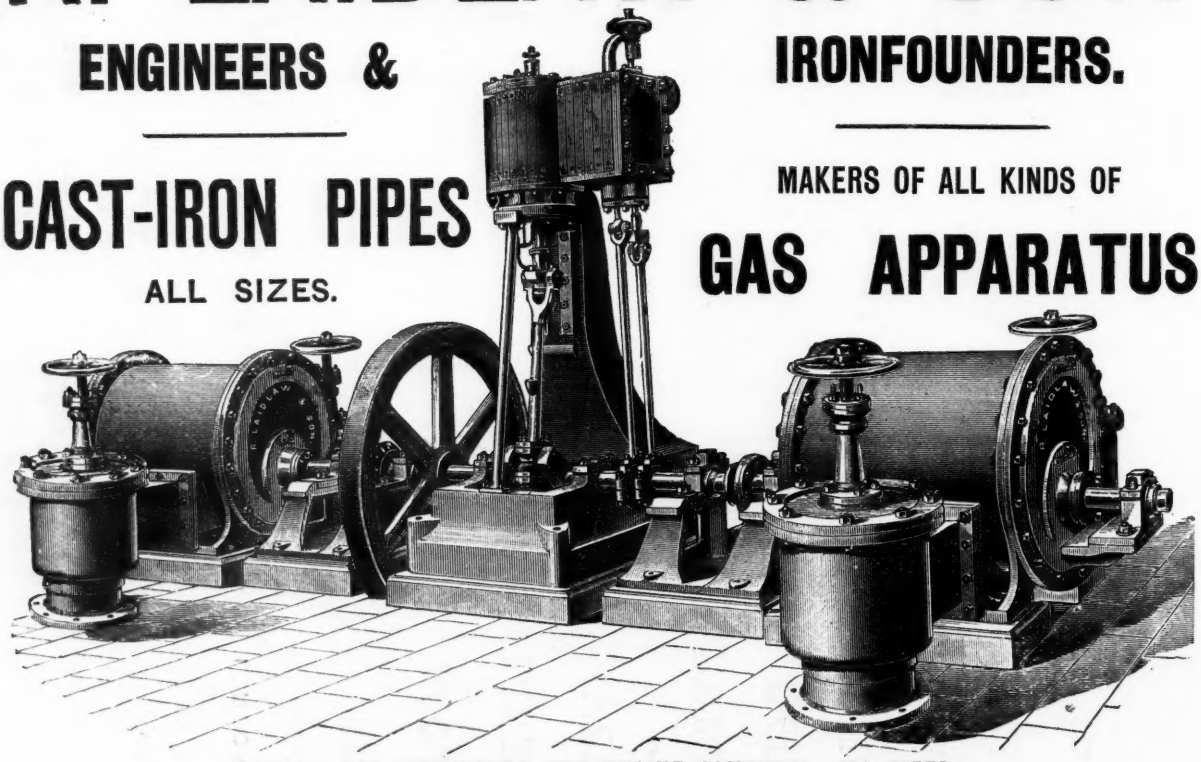

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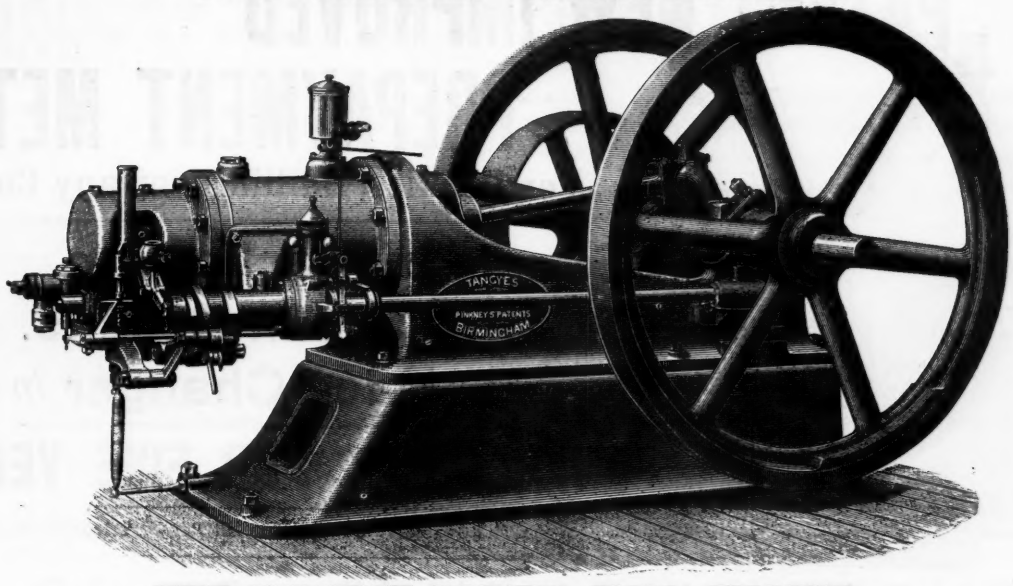

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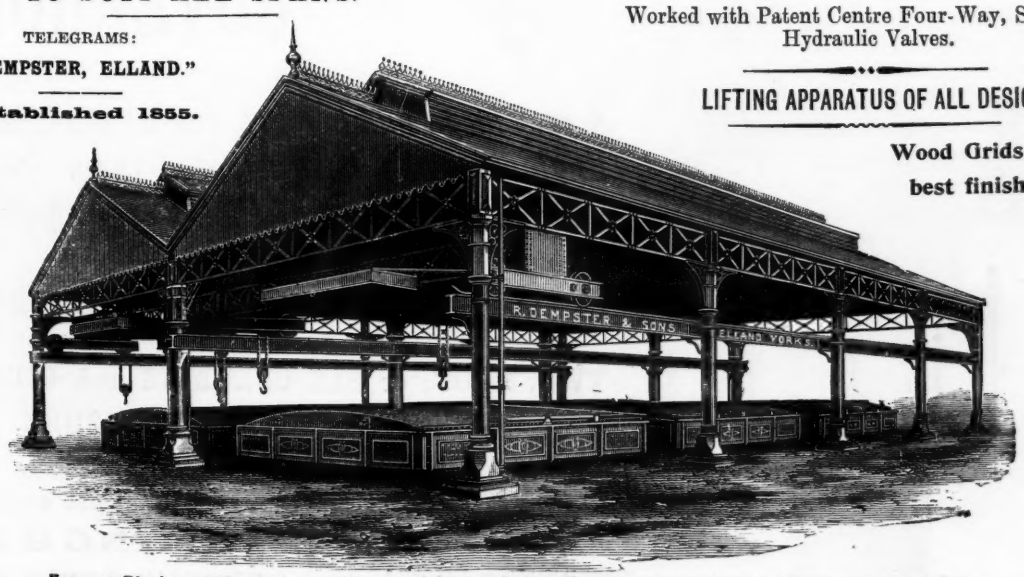

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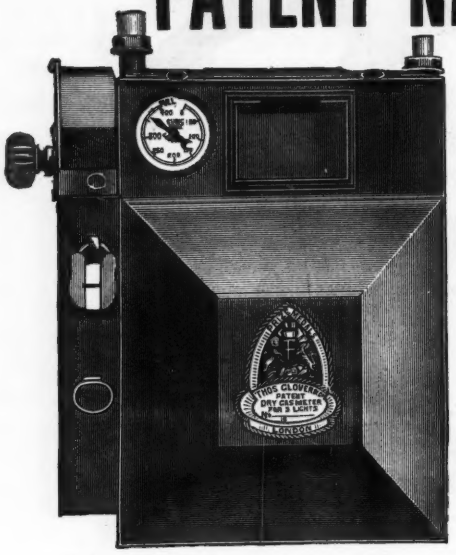

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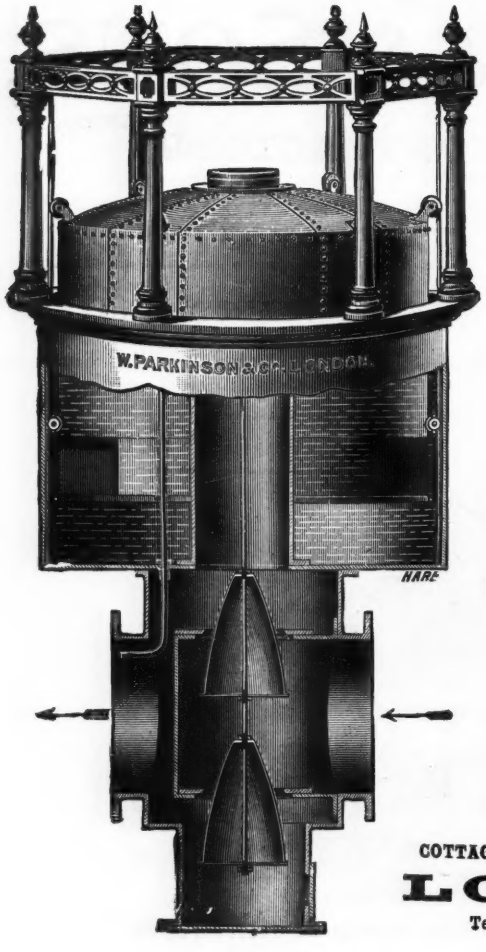

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EDITORIAL NOTES.

More on the "Workman-Director" Question.

THE letter which Mr. John Ewart, one of the Directors of the South Metropolitan Gas Company, has addressed to us on the "Workman-Director" question, is welcome—apart from its own particular merit—as a further contribution to the discussion of a subject which we are desirous of presenting before our readers in every aspect. Mr. Ewart is one of the principal opponents of Mr. Livesey's scheme upon the South Metropolitan Board, as was made apparent at the now-famous Wharncliffe meeting. He then delivered a speech setting forth the views of the majority of the Directors, with very considerable cogency and force as we were glad to acknowledge at the time. It could have been wished, for his own sake, that further reflection, and the study of what has since been written upon the subject, had enabled him to strengthen his case with new argument. As it is, the letter we publish to-day will come as a distinct disappointment to all those who are solicitous of seeing the question debated seriously, and with strict reference to the points of difficulty involved in solving it in any sense, We cannot believe that Mr. Ewart will feel proud of his letter when he reads it in print. He would have been better advised if he had contented himself with a recapitulation of what he said at the meeting, supplemented by what he may have meant to say—for no man ever satisfies himself that he has "delivered his soul" in a single oration. He could easily have amplified his objections to the scheme, doubtless to public advantage; inasmuch as it was understood that he was prepared, in the event of the "Instruction" of the House being considered by the Committee on the South Metropolitan Bill, to give evidence for himself and his colleagues of the majority. He has chosen another course; and it is only for us to deal as briefly as possible with what he has written.

In the first place, it is a very "cheap" kind of wisdom to say, when a proposal is made for one to act in a matter in one's own individual or corporate capacity, that one would like to see some other person try the experiment. Such a declaration is absolutely futile as a step towards the settlement of the question, whatever it may be; because whoever makes it will have the excuse of saying afterwards that circumstances alter cases, and therewith falling back in any event upon his preconceived notions. This remark applies perfectly to the somewhat sneering suggestion that we should show, in the conduct of the business affairs of the JOURNAL, a lead for the South Metropolitan Directors to follow in the administration of their gas undertaking. It would be an impertinence for us to intrude into this controversy any statement of how the editorial and commercial affairs of the JOURNAL are conducted. Mr. Ewart has thought fit to challenge us to do so; and if he will show to the satisfaction of even his colleagues—to say nothing of our own or our readers' conviction—how any conceivable point of editorial responsibility, publishing enterprise, or printing work can bear upon the administration of a statutory gas undertaking, we will gladly follow him into further developments of his *tu quoque* observations. On the face of it, we venture to think that Mr. Ewart would be the first to exclaim, and with reason, against any presumption that might be raised for the guidance of Gas Directors from any experience so utterly diverse as that gained in the walks of journalism.

That is really all that need be said on the subject of Mr. Ewart's letter. There are, however, some points in the last letter of Colonel Makins, which we left undiscussed last week, and may just as well deal with now. Colonel Makins again misunderstands our attitude with regard to Mr. Livesey's scheme, which we thought had been made sufficiently clear. He says that he learns he was mistaken in supposing that we agree with Mr. Livesey in regarding it as "*the* natural outcome" of the South Metropolitan profit-sharing scheme; and he goes on to say that if it does not flow out of profit-sharing, it has no *raison d'être*. We now italicize the definite article, as it seems to be necessary to refer to what we said in this regard on the 19th ult. Of course, the idea of workmen-directors springs out of profit-sharing in one form or another; and it was never proposed in any other connection. (See also Mr. Louis R. Ehrich on this head, *ante*, p. 307.) True, the appointment of workmen-directors is arguable from the case of workmen-stockholders; but it is nowhere denied

that workmen cannot become stockholders, much less attain to seats on the Board, without special facilities being granted to them with this object. Anything of the kind, however, if it could be distinguished from profit-sharing—which term, be it remembered, is a very elastic one—must still necessarily involve the extension of a special preference to this class of stockholders, to which the opponents of Mr. Livesey's scheme take objection on principle.

So far as the discussion on the scheme has gone, it has brought out little more from the opposition than variations upon the simple theme, "I do not like thee, Dr. Fell," with the same general conclusion. It would be a pity for the controversy to end thus, in the "No-Thoroughfare" of individual liking and disliking. The project, as affecting the South Metropolitan Gas Company, is not very likely to drop, especially after the official blessing it has received from the representatives, past and present, of the Board of Trade. One could well understand the reluctance of a private owner of gas-works to sharing the responsibilities of his administrative position with a stranger in interest to his concerns. But why this bitter animosity to an extension, under safeguards, of the principle of copartnership should be entertained by the Directors of statutory, sliding-scale, and especially profit-sharing Gas Companies, is a little difficult of comprehension upon any other reasons than such as refer to individual prepossessions.

On Behalf of Ratepayers.

THE letter from the correspondent who signs himself "Warning," on the subject of Sir Albert Rollit's Bill for the amendment of the Borough Funds Act, may be referred to here, if only for the purpose of reminding our readers that the matter has already been noticed more than once in these columns. Our correspondent is justified in contending that the object in promoting this measure is the objectionable one of concentrating all legislative power in corporations, and so rendering the ratepayer helpless in the hands of his municipal representatives. Now, the interests of ratepayers are not always identical with those of his legal representatives; and it is, one would think, manifestly undesirable that the latter, who are chosen primarily to carry out administrative duties, should be practically empowered to initiate, on their own motion, schemes of legislation which would often become law, the effect of which might be to revolutionize the circumstances of the ratepayers. Moreover, there are at least two orders of ratepayers who would be prejudiced by the passing of such a Bill as the one in question. There is the ordinary ratepayer, the owner or occupier of rated premises, whose interest it is to keep his representatives within bounds; and there is the ratepayer who is interested in local statutory companies, towards which, as our correspondent very truly observes, the attitude of a certain class of municipal politicians is consistently predatory. To whatever category he belongs, the ratepayer, as the law now stands, knows pretty well, in the majority of towns, what powers the local authority can exercise. He is quite able—not perhaps wisely, but at any rate excusably—to watch with indifference, not untinged with amusement, the election upon the local municipality of mouthing politicians who catch the ears of ignorant voters by professing to make for them a new heaven and a new earth. He well knows by experience that, when these demagogues once get landed upon Hackney Coach Committees, Market and Bridge Committees, and so forth, they will find in their legalized duties little scope for attempts at bringing in the Millennium by force, and at other people's expense. But what if these unquiet spirits were able to jump straight from the tail-board of a mass-meeting van into a Parliamentary Committee, with full power to order Bills for effecting anything and everything their crude fancy might commend to what they call their judgment, to be promoted at the public charge?

We see what has happened in this way in the London County Council. The idea of polling London with reference to a Bill in Parliament being impracticable, the London County Council are exempted from this obligation; with the result that they have spent, and are spending, large sums of the ratepayers' money upon attempts to legalize Betterment, to obtain the property of the Water Companies at a knock-down value, and so forth. It is absurd to pretend that the example of the London County Council in this regard is one to be copied with advantage throughout the country. Happily, there is no other place like London in having no local public opinion upon which the local authority can fall back for countenance, or correction, as the case may be. The body of the ratepayers of our provincial cities and towns, with the help of their usually excellent local newspapers, are quite as well informed upon the merits or demerits of all possible schemes of local legislation as their temporary representatives in the Corporation. The latter have no justification for pretending to exceptional capacity in this respect, and as local politics are too often worked, sound judgment upon weighty public matters is even more likely to be found outside corporations than inside these scratch assemblies. Wherefore this is certainly not the time to take away from the unofficial ratepayer the protection which is his under the Borough Funds Act. As we have already had occasion to show, the example of Dublin is a case in point. The Dublin Corporation Bill was rejected upon the poll, simply and solely because the ratepayers saw in it a menace of additional taxation; and, by their vote, they gave the vapouring politicians of the Council Chamber to understand that the Corporation is not yet a Parliament with full powers to exploit Dublin in the interest of a clique of lawyers and self-interested schemers. The country does not want such Parliaments; and if Sir Albert Rollit is as profound as he is industrious, he will not take long to perceive that there are the gravest reasons, in the interest of municipal institutions themselves, why the members of such bodies should not be permitted to usurp *quasi*-legislative prerogatives.

The Petition of the Metropolitan Authorities in Regard to the Gas Supply.

THE *ultimatum* of the associated Metropolitan Local Authorities in the Administrative County of London, on the gas supply questions that have been raised by Mr. James Rowlands, M.P., and others, has been delivered. As will be seen under our "Parliamentary Intelligence" in another column, General Goldsworthy has presented to the House of Commons the long-threatened petition asking for an inquiry into the present working and management of the various London Gas Companies, and as to existing statutory rights and past results, financial and general, of the statutory sliding-scale of price and dividend. As though this were not enough matter for one reference, the petitioners also ask that the inquiry shall include the standard and testing for illuminating power; and they profess to contemplate as its result the introduction of a Bill to reduce the standard price and statutory dividends now authorized to be charged and paid by the Companies, for rendering the price of gas uniform throughout the Metropolis, to abolish meter-rents, and to improve the standard of quality and illuminating power. The great heart of Westminster, which has had little to excite it of late in regard to gas legislation, would beat high at the prospect of such lucrative engagements as the work of such a Committee of Inquiry would offer. We have no sort of objection to a windfall like this coming to the noble army of unemployed consulting engineers and "experts;" but we most emphatically protest, in advance, against the proposal, certain to be made, that the Companies should pay for it. Indeed, whether the petitioning Local Authorities or the Companies are made chargeable with the cost of the proposed inquiry, the public of ratepayers and gas consumers would have to find the money in the long run; and it is ridiculous to ask the community to pay heavily for teaching the ignorant busybodies who have been moving in this matter the elements of Metropolitan gas polity. We do not doubt that a good Committee, properly advised, might find something instructive to say respecting the actual results of the legislation, which the Committee on the South Metropolitan Bill did not feel strong enough to touch. But the question is whether sufficient good could come of such an inquiry as is here asked for, to justify the investigation. The matter is not now before Parliament as it was in 1875; and a strong case for parliamentary interference would have to be made out to induce the Government to move against the Companies. For this is what the cry for inquiry amounts to. Unless the Government take up the question, nothing can be done in it. If the Government were to move in any other way than by means of the issue of a Royal Commission, the Companies would refuse to take any part in the comedy; and it would be setting up Mr. Rowlands and his following upon an undeservedly high pedestal to admit that anything they have up to the present

established as regards the gas supply of London constitutes a case strong enough to warrant the grant of a Royal Commission. With respect to the right of Parliament to inquire into the working of legislation that has been added to the statutes of the realm for a specific purpose, there cannot be any dispute. It is often done, to great public advantage. Whether the time has now come for such an investigation of the effects of the gas settlement of 1875-76 is a general question which deserves to be answered upon its merits; and we beg leave to doubt whether the persons who have undertaken to stir up the matter at the present juncture are quite the right people to put the question in such a form as to compel the attention of Parliament to the subject as a whole.

Trade Union Delegates in the Eye of the Law.

JUDGMENT has been given by the Court of Appeal upon the application of the defendant Allen for a new trial in the case of the dispute between the Boiler-Makers and Shipwrights, mentioned in this column on Feb. 19. It will be remembered that Allen acted as the "walking "delegate" of the Boilermakers' Union; and he was instrumental in getting the complainants discharged from their employment, in pursuance of one of those "boundary" disputes which would not cease from troubling industry if all the Unions were "recognized" to the top of their bent. At the trial, the jury found against Allen; assessing the damages at £20 for each of the two complainants in the action. The Court dismissed the application. In his observations on the case, the Master of the Rolls was rather inclined to magnify the position of Allen, as an elected delegate of his Union. His Lordship said that a man holding this office was not under the orders of the members of the Union, nor even subordinate to the Executive Committee. He acts entirely on his own discretion; and if he does any wrong, he is answerable for it. Of course, the Union pays; but when it is recognized that a trade delegate has it in his power to get the Union into a scrape (as was done in this instance), the Executive will probably see to it that they put prudent men in office. The question of what constitutes "malice," in the legal sense, in connection with such proceedings as those of the defendant Allen, came before the Court; but the Master of the Rolls explicitly declined to commit himself to a definition of the term for general application—saying that such questions are for the jury in every particular instance. Lord Justice Lopes went a little further into this question, holding that "any person might lawfully advise another "either to discharge a servant or to break a contract. But "if he gave such advice maliciously, and with intent to "injure the servant or the other party to the contract, that "was unlawful and actionable." This is stated to be the sense of what was laid down in *Temperton v. Russell*. While not attempting to give a general definition of malice, Lord Justice Lopes thought that, for the purposes of the case before him, "it might be taken that when a person wilfully "did an act to the injury of another without lawful cause "or excuse, that was evidence of malice;" and the conduct of the delegate Allen was declared to come clearly within this definition. Lord Justice Rigby concurred. All this is very bad and discouraging for the exponents of militant Trade Unionism, inasmuch as it goes to indicate that the interest of such an organization is not to be pleaded as sufficient excuse for the acts of a person who takes it upon himself to interfere with the conduct of another person's business, or to get a man discharged from his lawful employment. Nobody wishes to prevent a Trade Union official or workman from acting up to his rights under the common law; but he must not make a law for himself, and victimize those who do not see fit to regulate themselves with reference to it.

Mr. R. Dixon Steele has become a partner in the firm of Messrs. Bradbury and Hirsch, of Liverpool. Mr. Steele has been for some years in business as a sulphate broker.

Imperial Continental Gas Association.—The Directors of this Association recommend a dividend of 5 per cent. for the half year ending Dec. 31 last, together with a bonus of 1 per cent., both tax free.

The Bridport Managership.—Mr. J. Cornish, for many years assistant to his father at the Bridgwater Gas-Works, and recently with Messrs. E. Cockey and Sons, Limited, of Frome, has been appointed Manager and Secretary of the Bridport Gas Company, Limited, in succession to the late Mr. T. Giles.

WATER AND SANITARY AFFAIRS.

THE expected debate on the subject of the Water Bills took place in the London County Council on Tuesday last, extending over a period of three hours; the Progressive party making the most of their artificial majority, so as to obtain a continuance of the policy which demands the transfer of the water supply from the Companies to the Council. How the interests of the ratepayers are imperilled by the proposed "leap in the dark" was well shown in the speech by which Sir John Lubbock introduced his amendment, asking for a preliminary consideration of the subject. The same views, in a more extended form, had previously been explained and enforced in an article contributed by Sir John to the current number of the *Nineteenth Century*. Whether any such plan as that propounded by the learned baronet, further described in a letter to the morning papers, and given elsewhere, is needed for the protection of the public, is altogether a doubtful point; but certainly the scheme sketched out has the merit of an intermediate course, which takes the control of the supply partly out of the hands of the Companies, and at the same time leaves them the full share of the pecuniary responsibility. The promised advantage to the Companies is that they would cease to be harassed by attempts to buy them out or to upset them; while to the ratepayers there is the assurance that the large outlay now in prospect would have to be faced by the Companies alone. If the Progressive party were aiming less at power, and more at the public benefit, there is no reason why they should turn away impatiently from such a proposal. The Companies might demur, but nobody else need complain.

The tone of last Tuesday's debate serves to show the dominance of one idea in the Progressive mind, and that is to get possession of the water supply, paying as little as possible for the acquisition. What they are willing to pay they are not disposed ro reveal; and what will be the ultimate result of the transaction they are equally unwilling to consider. We have remarked from the outset on the extraordinary nature of the terms by which the Council seek to have the arbitration as to price brought under restriction. Perhaps it has hardly been seen how these restrictions bear on the position of the ratepayer after the property has been acquired. If the present water-works are so defective, and if there is such a pressing need for an extended and perhaps a supplemental supply, there is the inevitable prospect of a large expenditure to make good the existing deficiencies. For every pound saved in the purchase, consistency will demand that at least two must go in the subsequent improvement. Sir John Lubbock asks that the Council shall sit down and count the cost. But the Council, overborne by Progressive tactics, still refuses to do anything so sensible and businesslike. Yet when some of the Vestries four years ago had the temerity to bring in a Bill for the creation of a Trust which should buy out the Water Companies, the Council were shocked at the idea. The Parliamentary Committee of the Council denounced the scheme; and their Chairman, Mr. Charles Harrison, signed a report, showing that the Trust would not only have to purchase the existing water-works, but to improve them, and to bring in a supply from new and independent sources. This, it was declared, constituted a policy to which it was scarcely possible to conceive that the inhabitants of London ought to stand committed. Yet this same policy, so objectionable when seen in the shape of a "Trust," is considered the very acme of public virtue when undertaken by the Council.

In further exemplification of the marvellous change of front exhibited by the Council on the subject of the water supply, Sir John Lubbock has cited from the official records the report of the Water Committee, signed by Lord Farrer and presented to the Council after the "Trust" Bill had been defeated. In that report, objection was taken to the enormous outlay which might be expected to result from the obligatory and immediate purchase of the water undertakings on arbitration terms; and it was advised that "such a purchase must therefore be resisted "at all hazards." "Future liabilities" were then the bugbear; but these have now lost their terror, or rather the Council refuse to contemplate them. Shutting their eyes, the Progressives declare that they cannot see anything to be alarmed at. Sir John Lubbock shrewdly proposes that the Companies shall be left to face the financial

difficulty, and to get all the water that is wanted. His motto is "control" in preference to "purchase." But this entirely fails to further the purpose for which the Council is now being moved. Mr. Ritchie was told in the recent debate that the Companies had refused to negotiate with the Council; and the *Daily Chronicle* taunts this distinguished member with having blundered in not knowing the fact. The whole truth is that the Water Companies refused to negotiate upon a certain basis, which was that there should be no recognition at all of what were designated their "monopoly rights"—the phrase employed to discredit their rights as secured by Act of Parliament. The pretence of inviting negotiations is now at an end, and all the resources of the public purse are employed to carry on a warfare which entails very heavy costs on both parties, whatever the issue may be. The details of the Council's "Budget," as presented last week, contain an estimate of £14,000 in connection with the Transfer Bills, following on £5000 in the estimates for last year. In addition, there is a sum of £5000 put down in respect to the cost of coming inquiries into areas of supply and other expenses to be incurred "with a view to the promotion of a Bill in Parliament." Last year the estimate in respect of inquiries under section 3 of the London Water Act, 1892, was £3500, following an actual outlay of very nearly that amount a year earlier. The water campaign is a costly one; and nothing would make it so expensive as a victory on the part of the County Council. The "little finger" concerning which *The Times* has given warning, is a heavy one.

Death of an Austrian Gas Engineer.—We regret to learn, through the *Gastechniker*, of the death, on the 6th ult., of Herr Georg Grotz, of the Baden and St. Pölten Gas-Works. The deceased was born in 1840 at Bayreuth, and prior to his appointment to the above works was employed at Buda-Pesth. He was a member of the Committee of the Association of Gas Engineers of Austria and Hungary.

Mr. T. Settle, the Gas and Water Works Manager of the Knaresborough District Council, has had his salary increased by £10 per annum, in consideration of past and prospective extra duties in connection with the water-works, on which, it may be remembered, he some months ago presented a very carefully prepared report, which was noticed in our columns at the time. Mr. Settle has recently adopted Sunday closing at the works.

Sir John Lubbock and the London Water Supply.—Sir John Lubbock has addressed the following important letter to all the London daily papers: "The question of our water supply is of such immense importance to London, that I hope you will allow me a few words in reply to the assumption that, because other cities have bought up their water companies, it would be wise for us to do so. There are several respects in which the position of London is different from that of other towns; but the main one is that our Water Companies are limited to a 10 per cent. dividend, with an asserted right to make up the back dividends to the same rate. Now, of the eight Water Companies, four are paying the full dividend, one is paying 9½ per cent., one 8½, one 8, and the Southwark and Vauxhall 6 per cent. Excepting, therefore, the last, they are practically able to pay the full maximum dividend. Sufficient attention has not, I venture to submit, been given to this important fact. As regards the alleged right to make up back dividends, the House of Commons Committee proposed that the Water Companies should be put on the same footing as the Gas Companies—viz., that the right to make up back dividends should be limited to six years. To secure control and protect the public, I propose that three Directors should be nominated on each Board—one by the Government, one by the London County Council, and one by any outside area supplied by the Company. This would, I believe, be acceptable to the Companies, because it would give them security, and relieve them from the great legal expenses to which they are now put. It would also be advantageous for the ratepayers. They would secure control; they would be saved from all risk; the expenses of providing an additional supply, if necessary, would fall on the Companies, while, under the proposal of purchase, it would fall on the ratepayers. Moreover, all moneys borrowed by the ratepayers have to be redeemed within a limited number of years; so that we should not only have to pay for the water, but for the redemption of the stock. Finally, if the Companies make larger profits, the difference would go in diminution of the water-rate; while if the profits should be less, the difference would fall on the shareholders. It is obvious, therefore, that this arrangement would be far more advantageous to the ratepayers than that of purchase. We should secure the profit without running the risk of loss. There would, moreover, be other important advantages in the system of 'control' as opposed to that of 'purchase,' into which, however, I will not now enter."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 812.)

With only four working days, followed by a close holiday of four days more, it was not to be expected that business last week would be particularly abundant on the Stock Exchange. Being account-week, there was, of course, full occupation over the settlement; but fresh business was not much undertaken. Prices, however, did not suffer from any depression, but rather the reverse. The brilliant weather gave promise of good holiday traffic for rails; while the prospects of the restoration of peace in the East, which are somewhat hopefully indulged in, suggested the revival of that trade which has suffered from the war. Commodities dependent upon silver also looked up. So that, taken altogether, it was a favourable week. Money was in very fair demand, both for Stock Exchange and for other purposes. Business in the Gas Market was very quiet; and changes in quotations are few and, for the most part, slight in degree. All, however, are for the better; and they indicate the general and continued improvement in the position which this class of security is assuming. In Gaslights, there was only a restricted amount of business in the "A;" and the figures marked day by day were very steady, and gave no sign of any disposition to change. Hardly anything was done in the debenture, preference, or limited issues. South Metropolitans also were very quiet; and the only feature in connection with them is that the quotation of "B" was drawn into its normal margin—settling down after the flutter caused by the failure of the stock-splitting scheme. A few bargains were marked in Commercials at improved figures; and both issues show a rise *ex div.* Among the Suburbans and Provincials, the only noteworthy point is the progress of Bristol towards a 4 per cent. price. The Continental Companies were as quiet as the rest, and did not move at all. Among the others, San Paulo rose, in view of a higher dividend; and both Bombays made a fractional advance. The Water Companies were fairly busy, and the general tendency was better, although there was some irregularity.

The daily operations, being very light, may be briefly summarized. All Gas stocks were quiet on the opening day; prices were moderate; and quotations were unchanged. Business on Tuesday was more active, and several advances were scored. Commercial old rose 1; ditto new, 2; San Paulo, ½; and Bombays, ¼ each. In Water, Kent improved 3; and Lambeth debenture, 2. Transactions in Gas began to languish again on Wednesday; and the only move was a gain of ½ in South Metropolitan "B." Lambeth 7½ per cents. rose 2. Thursday was very quiet; but prices were firm. Bristol and Commercial old rose 2 each. Friday and Saturday were close holidays.

ELECTRIC LIGHTING MEMORANDA.

Report on the St. Pancras Conduit Incrustations—A Misapplication of Mr. L. T. Wright's Observations—Mr. Langdon on Electric Lighting for Railways.

The last has not been heard of deposits caused by electrolysis in electric light conduits. Last Wednesday, the report of the Committee of members of the Royal Society and the Institution of Electrical Engineers appointed to confer with the Electrical Adviser to the Board of Trade upon the St. Pancras discovery was published in all the London newspapers. The Committee give it as their opinion that the explosions in this district were caused by the firing of an explosive mixture of coal gas and air by sparks arising from the incrustation found in the culverts. They assert that sparks may be caused either by the incrustation itself, acting as an imperfect electrical conductor, or by moisture coming into contact with metallic sodium or potassium, "both of which metals have been found to exist within the incrustation." This pronouncement should silence the electrical partisans who have tried to make fun of the supposed discovery by Major Cardew of metallic sodium in the St. Pancras conduits. The origin of these dangerous alkaline metals is stated to be alkaline salts, chiefly derived from the soil, and conveyed by moisture along the fibres of the wooden bearers towards the negative conductor. To avoid a repetition of the trouble, it is recommended that the bearers in question should be replaced by others not capable of conveying moisture, together with better insulation between the conductors and the bearers. The Committee are of opinion that it is desirable that means should be provided by which the conduits might be inspected throughout their whole length—a "large order," surely, for the St. Pancras Electricity Committee. They also observe that "they have not thought it within their province to investigate the causes of the presence of coal gas within the electric lighting conduits; but it is obvious that this is the primary source of danger." If the Committee had not exercised this prudent reserve, they would hardly have been in a position to report so speedily. When flint and steel strike fire, it is idle to inquire which is the primary source of the sparks. The Gas Company will be very glad to keep their gas in the mains and services provided for it; and if the St. Pancras Vestry will discontinue

the manufacture of sodium and potassium by means of their unaccounted-for electricity, there will be no more culvert explosions of the Endsleigh Gardens type.

An electrical contemporary professes to be greatly concerned about the future of coal gas, and has been "constrained to indicate certain directions in which the monopolists may exercise commercial activity when that time shall arrive, which, they are aware, is not far distant, when they will be re-echoing Othello's mournful plaint up and down the land." Of course, this means cooking; and gas companies are amiably assured that they ought to be thankful for escaping from "total effacement." Curiously enough, this nonsense leads up to an odd appreciation of Mr. Lewis T. Wright's recent writings upon the connection between the illuminating and heating power of coal gas. It may be taken for granted that, whatever were Mr. Wright's objects in writing as he has done about gas, that of providing electrical scribes with materials for a cheap jibe at gas companies was not among them. But how shortsighted of our critics to give up cooking to the gas companies as a solace for the predicted loss of their lighting business, when it had become understood that the electricians were getting together quite a comfortable little connection in the same line. Is this all a myth? It would appear so; and we are not surprised. As to the sudden disappearance of the gas companies' lighting business, this is of course within the bounds of possibility. But if it goes in any such way, it cannot be the electric lighting companies that will succeed to it, for there is nothing like enough of them yet to take up the normal increase of the general public demand for light, to say nothing of doing the whole of the work. But how idle is this pretence of regarding gas lighting as upon the point of dissolution, while as a matter of fact there is no denying that the companies are without exception "still growing."

An interesting paper upon the employment of electric lighting for railway purposes was recently read by Mr. W. Langdon before the Institution of Electrical Engineers. The original matter of the paper consists in the main of the result of the author's experience on the Midland Railway. He is not free from the common trick of his fellows, of imputing to electric lighting all sorts of advantages and economies which he makes no attempt to prove are actually realized. Thus he babbles about the superior healthfulness of incandescent lighting for railway offices, waiting-rooms, &c., because it does not use up the oxygen of the air; and he sagely opines that, as regards the superior cleanliness of the light, "if we save by the electric light but one cleaning in three, it is probable that even the drawbacks of a small installation, or the present cost of current when obtained from an outside source, are fully met." This sort of argument, if such it may be called, has surely had its day. As to the breathing of air "robbed of its oxygen," which is put as the consequence of gas lighting, one wonders how the public and railway officials survived the trial; and if the introduction of electric lighting has made itself felt as beneficial to the Midland staff, we can only suppose that the booking offices, parcel offices, and platforms of this line are not so airy, not to say draughty, as such places generally are. But Mr. Langdon also says that the rooms and offices where the electric light has "recently" been installed, with so much benefit to the health of the staff, are "practically as clean at the present moment as when the light was started." Now, one cannot have one's bread buttered on both sides. If it is creditable to the electric light that, after a very brief experience of it, the health of the Midland Company's staff shows an improvement, it is no great recommendation that it has not made a great mess in the buildings during this short period of its usefulness. But we refrain from labouring the point. Of course, the electric light on the Midland is altogether lovely. It is more interesting to us to learn that this Company are making an extensive trial of gas-engines for electric lighting; having some 405-horse power upon this system devoted to the purpose, chiefly at Leicester.

The 1894 Transactions of the Incorporated Institution of Gas Engineers.—We have received the volume of Transactions of the Incorporated Institution of Gas Engineers for the past year. It has been produced under the editorship of the Secretary (Mr. T. Cole, Assoc.M.Inst.C.E.); and it is published by Messrs. E. & F. N. Spon. The technical matter submitted to the meeting of the Institution in May last is presented with the necessary illustrations. Mr. Meunier's paper describing the extensions at the Stockport Gas-Works is accompanied by as many as eight folding plates; the papers by Mr. Glover and Mr. Herring, on two different enrichment processes, having three each. In the Appendix are given the papers communicated by Mr. G. E. Stevenson and Mr. E. L. Pryce—the former (illustrated by eight plates) containing a description of the new purifiers and staging at the Rochdale Road Gas-Works, Manchester; and the latter giving analyses of coal gas from various districts. The Appendix is followed by abstracts of papers published in various chemical journals; and after these comes an entirely new feature, and one which will very considerably enhance the value of the volume. It is entitled an "Index to Gas Literature, English and Foreign," compiled by Mr. F. S. Cripps, Assoc.M.Inst.C.E. This important addition to the Institution's Transactions will be more fully noticed in a subsequent issue.

HOLOPHANE GLOBES.

It is a common experience in regard to mechanical inventions, that a new development in a particular direction calls forth a number of ancillary appliances which improve not only the arrangement in connection with which they are designed to be used, but are also in themselves improvements of general adaptability. A familiar illustration in point is the sewing-machine, which, although a mechanical triumph, was not a satisfactory working instrument until a notable corresponding improvement had been brought about in the cottons intended for use with it. The result has been that all sewing cottons and threads, whether specially manufactured for machines or not, are now of better make than was obtainable before the introduction of these machines. An interesting and important exemplification of the same process of mechanical improvement upon what may be called the principle of parallelism has just been brought under our notice in connection with the lighting industries. Welsbach incandescent gas-burners, and electric arc and incandescent lamps, are all novelties which have not only been received by the world as improved methods of lighting in themselves, but have also, as our "Register of Patents" bears witness, proved the fertile causes of attempts to improve lighting appliances and arrangements in general. Many of these latter devices relate to matters connected with, or subsidiary to, any artificial lighting service; and in this respect they might have been brought forward at any time before the introduction of the particular modern systems of lighting mentioned. The fact remains, however, that they are, to all intents and purposes, fruits of the greater concentration of inventive minds upon the practical problems of lighting which has followed the introduction of the improved systems in question.

One of the most promising of the fields open for practical research in connection with artificial lighting is indicated by the much-debated question of diffusion. It is unnecessary to repeat here what has been stated in the course of recent controversies as to the relationship (or the want of it) between the luminous intensity of light-sources and their lighting effect. Much remains to be cleared up on this head. But it is not disputed that the indications of the photometer are not the sole thing to be regarded in practical lighting work. If only for physiological reasons, the concentrated intensity of high-power light-sources is admittedly a drawback to their utility under conditions shown by photometrical tests to be those of their highest efficiency. The naked arc lamp is unmanageably intense; and the same may be said, in their degrees, of naked incandescent gas and electric lamps, recuperative gas-lamps, and highly carburetted gas-flames. Even the most powerful oil-lamps are not free from the same reproach. With some lights, the cure for this evil is easily found—it is simply to avoid using them of intensities beyond those which the human eye can comfortably endure when both the light itself and the objects intended to be seen by it are in the field of vision. Candles, oil-lamps, and ordinary coal gas can all be dealt with upon this principle. There are artificial lights, however—and in this category all the intense or high-power light-sources are comprised—which cannot be rendered unobjectionable by the method of subdivision. An electric arc lamp of about 1000-candle power, naked, is the smallest that can be trusted to maintain itself with reasonable constancy. A Welsbach burner will not do the system justice when consuming less than 3½ cubic feet of gas per hour, and yielding an illuminating power of (say) about 55 candles. Whatever the illuminating power of an incandescent electric lamp, the filament must, from motives of economy, be kept at such a degree of brilliancy as to produce a painful effect of irradiation in the human eye, if regarded without a tempering screen of some kind. A recuperative gas-lamp is nothing if the flame is not blindingly white hot.

Hence, for all these high-power, intense lights there is nothing for it but a shading of some kind. But shading, as ordinarily effected, means simply obscuration and loss of light. A very thick opal or waved glass globe has to be used if the object is to render the dazzling point of light of the electric arc undistinguishable; and this entails a sacrifice of some 60 per cent. of lighting effect. The same remark applies to the Welsbach burner, as to which we do not hesitate to aver that any possibility of direct vision of the incandescent mantle is destructive of the claims of the light to be a pleasant one for any purpose. How objectionable the direct vision of the incandescent electric lamp filament is held to be by electricians, is sufficiently proved by the various attempts that have been made to get over the difficulty without saddling the already costly light with an additional cause of expense.

It seems verging on the absurd to have to continue the argument with a reference to the possibility of cutting or pressing the surfaces of clear glass globes into a system of lenses capable of reflecting and refracting light; for, as all the world knows, this was done by Fresnel for lighthouse purposes a very long time ago. Yet, strange as it may seem, success in producing at a reasonable price a globe for ordinary or intense lights, suitable for general use in interiors, and embodying the true principles of so reflecting and refracting the light as to render the source invisible while diffusing and distributing most of the rays to the best advantage, has been reserved for the present day, and for Messrs. Blondel and Psaroudaki. This invention, which we

have had an opportunity of seeing exhibited at the office of Mr. S. M. Scott, the Manager for England, at No. 35, Queen Victoria Street, E.C., is the "holophane" globe, briefly described in a "Note" in the JOURNAL for the 12th ult. (p. 534). Unless something unforeseen happens to spoil their prospects, Messrs. Blondel and Psaroudaki bid fair to remove, by their ingenious invention, the chief obstacle to the complete popularity of all commercial high-power lamps and light-sources of high intensity and small surface. There are no illustrations available as yet whereby we might show the holophane globe in operation; but we can testify to the fact that it has the appearance, when enclosing an incandescent gas or electric lamp, of a vase filled with light, brilliant yet soft. The actual burner or filament cannot be discerned. The *desideratum* of the advocates of diffusion in lighting is thus in effect supplied, although the source of light is a mere line or spot. We are assured that it is the same with the electric arc light. As for the loss entailed by all this reflection and refraction, it is certified by M. de Nesville to amount in the case of an arc light to from 9 to 13 per cent. As this observer remarks, there is no other kind of globe in existence capable of realizing such a diffusion of light, and at the same time presenting such uniformity of effect. Seeing that the loss of light by transmission through clear glass is 8 to 10 per cent., the claim for the holophane globes that they do their special work for about 4 per cent. of loss is well established.

The principle of the holophane moulding is soon explained. The interior surface of the globe is formed into vertical grooves, which are so shaped as to spread out horizontally the rays proceeding from every part of the light-source. They are thus moulded to one regular section. The mouldings on the outer surface of the globe are horizontal, and have the effect of distributing the emergent rays in the vertical sense; and inasmuch as the light may be required in some instances to be cast downward, and in others to be equally dispersed, the angles of the outside grooves are modified accordingly. This is a very different thing from the unscientific cutting seen in ornamental cut-glass globes, which does nothing for the diffusion of the light. The holophane globes are manufactured in all sizes and in many shapes, such as spheres, tulips, cones, &c.; but the effect produced is always the same. Coloured glass can, of course, be had if desired.

M. Blondel, one of the inventors of the system, is the well-known Consulting Engineer of the French lighthouse service. To him the calculation and working out of the lens mouldings appears to be due; while his colleague M. Psaroudaki, of the Athens University, has devised the means whereby the globes can be made of cheap pressed glass, instead of requiring to be cut, like lighthouse lenses, which would, of course, have made them prohibitively dear. As remarked on a former occasion, the globes are patronized by the Paris Gas Company; and we venture to predict that, when once placed upon the English market on reasonable terms, they will be general favourites for all systems of lighting.

NEWSPAPER CRITICISM OF THE LONDON WATER COMPANIES.

MORE than once the JOURNAL has had occasion to notice the lamentably truculent tone adopted by certain newspapers in regard to the Metropolitan Water Companies. Not long ago, the *Daily Chronicle* published an article breathing fire and sword, so to say, against the Companies and all their works; but, of course, the special leanings of the *Chronicle* rendered its utterances quite intelligible, though not quite intelligent. When, however, the less impulsive weeklies echo the war-cry, it becomes a matter for greater surprise and proportionate regret. Sounder sense and surer judgment might reasonably be expected from weekly publications that claim to express the views of thinkers, as distinguished from the dailies, whose leader-writers have to turn out their diatribes in hot haste for consumption at the breakfast-tables of the people. Certainly, we should have looked for better things than the *Speaker* has put forth in its bellicose article entitled "Tackling the Water Companies." The *Speaker*, however, seems inclined to shout with the crowd; and, of course, the burden of the cry is "Down with the Water Companies!" For "a rich man who can afford to spend money in gratification of his feelings," our contemporary can imagine nothing more soothing and popular than "fighting his Water Company." This is the vicarious revenge which the writer suggests for all the "irritating injustices" that are laid at the door of the Companies. The *Speaker* almost despondingly confesses that the rich man, or any other man, will most probably abstain from following its friendly advice, and seems inclined to suggest that, in some mysterious way, the hand of justice is upon consumers for abandoning the Progressive faith. Water companies, gas companies, ground landlords, and vestries are declared to have played upon the public with impunity. For which reason, it is urged that everybody ought to be up and doing, though what precisely they are to "up and do" is left in considerable doubt. But the net outcome seems to be that the vestries (which have just been included in the general condemnation) ought to make an attack on the Companies all along the line. The ruling idea is that the Companies must be punished with the existing weapons of the law, if they are adequate; and that fresh weapons must be forged if the old ones are not found to be sharp enough.

It must be gratifying to the legal profession to find so respectable an organ as the *Speaker* crying aloud for more litigation—at other people's expense. Our contemporary positively yearns to let loose the dogs of law, not merely for a short and inexpensive campaign, but so that the matter (whatever the matter may be) shall be fought out even to the House of Lords—that "fearful institution" which the Master of the Rolls recently advised a litigant at all hazards to avoid. Failing the rich man—and rich men do not usually go to law for the fun of it, or to gratify weekly newspapers—the *Speaker* breathes the hope that a Syndicate will take it up; for obviously nothing would be so shameful as to leave the Companies alone, even if there be no case against them. But then, alas! doubt arises. It "might be held that the action lay not against the Company, but against the builder or plumber." This, we fear, is a confession which is calculated to damp the litigious ardour of the rich man or the Syndicate. It would be a poor consolation to carry this vague and mysterious action against a Company even to the House of Lords, and then to be told that the elusive and not always substantial plumber was the wrong-doer after all.

Having shown itself pugnacious to the last degree, the *Speaker* proceeds, with marvellous consistency, to counsel an attitude of conciliation on the part of the Water Companies. On no account would our contemporary see injustice done them; but, at the same time, they are to understand that they are "haughty monopolists," and that the terms to be made with them, when the time comes for settling accounts—presumably with the County Council—will depend on their good behaviour meanwhile. Confiscation, as a distinguished statesman once said, is contagious; and the *Speaker* seems to have caught it. We have not treated its utterances very seriously. There is no occasion to do so, or to notice them at all, perhaps, except for the purpose of showing how blind, partial, and illogical may be the counsels even of a reputable publication when it blindly goes with the crowd.

THE LONDON WATER COMPANIES; THEIR RIGHTS AND DANGERS.

UNDER the above title, the *Investors' Review* for the present month contains an article which, although adverse to the Metropolitan Water Companies, displays a better spirit, and a more frequent recognition of facts, than we often meet with in productions of this kind. The writer admits that the Companies "have not served the Metropolis badly on the whole;" but he says "it cannot be alleged that they have served it cheaply." In support of this accusation, he states that the eight Companies possess a paid-up capital of about £15,500,000; and in the year 1893 they drew a revenue of about £1,950,000 from water-rates alone "within the Metropolitan area." We would observe that the Metropolis forms only one-fourth of the area which appertains to the London Water Companies. Five years ago, the population served by the Companies in the outer portion largely exceeded a million, and was rapidly increasing. With respect to the revenue of the Companies, the figures just quoted are held to show that the return is "over 13 per cent. on the capital." We make it less than 13 per cent., even on the basis given. But it is further to be noticed that the trading profit for 1893, as shown in Mr. Lass's "Analysis," was £1,171,557, or £778,000 less than the revenue cited by the writer in the *Review;* and the net profit, after payment of interest, sank to £969,000, or 9·5 per cent. on the stock and share capital. Taking all the Companies together, their actual expenditure at the end of 1893 is put at £15,000,000; and the market value is said to range between 34 and 35 millions. On this arises the argument that "a most profitable monopoly has therefore been conferred upon these Companies." Including the income from "rents, &c.," it is alleged that the Companies net from 56 to 58 per cent. of their gross income every year. We are once more at a loss to verify the figures given in the article; our calculation showing a proportion of about 50 per cent. But it is acknowledged that the Companies are simply acting according to the "very high privileges" conferred upon them by Act of Parliament, or enjoyed by ancient prescriptive right; and "it is in vain now to cry out against them." Not only are the Companies permitted to pay large dividends, but their powers to levy water-rates are described as incapable of modification or reduction. The writer, however, overlooks the fact that the Water-Rate Definition Act, 1885, by declaring that the "annual value" of a tenement supplied with water should, in the Metropolis, mean "rateable value," very seriously reduced the income of the Companies. The Act was the more arbitrary and remarkable from the fact of its being limited to the Metropolis. If it is "a common belief," as stated in the article before us, that the Companies allowed some of their rights to remain in abeyance until the failure of the purchase scheme of 1880, we may suggest, on the other hand, that the reduction of annual value to rateable value was another result of the same failure, and would not have been heard of had the water supply fallen into the possession of a public authority.

The bias of the article to which we are referring may be

inferred from the avowal of the writer that he "had a good deal to do with the upsetting of the scheme" for the purchase of the water-works, as elaborated by the late Mr. E. J. Smith in 1879-80. Special objection is taken to the proposal then made for the creation of deferred stock in consideration of future profits down to 1892. The total price to be paid for the undertakings also "seemed monstrous" at the time. "Yet," says the writer, "we have sometimes regretted since that this bad plan was defeated, because the prospect of buying out the Companies cheaper has grown less in some respects with the passing years." From our point of view, we may say that, if Mr. Smith's bargain was a handsome one for the Companies, so also it would have proved beneficial to the public. But the opportunity was lost; and now it is asserted by the writer in the *Investors' Review*, that, except in one particular, the position of the Companies appears to be "impregnable." This is much the same as the conclusion arrived at by Mr. Archibald Dobbs. The Companies are merely exercising their legal powers. The one weak point which exists is said to be that they have no power to hinder either the citizens of London or groups thereof from procuring independent supplies of water. It is perfectly true that many London breweries have their own artesian wells; and the Government offices around Whitehall are supplied from a similar source. The City authorities have an artesian well; and we believe there is one in the Bank of England. There is nothing to prevent anyone from sinking his own well, and finding his own supply. But this does not affect the main question. Everybody may supply himself; but nobody may sell. Hence we meet with the admission that "in all ordinary circumstances these Companies have a monopoly." While suggesting that the monopoly is burdensome to the consumer and to the ratepayer, it is yet candidly stated with regard to the Companies that "the fact remains that the law of the land has sanctioned their franchises; and what Parliament, with the tacit consent of the citizens of London, has bestowed, Parliament has no inherent right to take away." This is certainly well put; and so is the declaration that "Stateistic" tendencies are as yet insufficiently developed to "make Parliament ready to disregard legality."

There are said to be two respects, and two only, in which the Government of the present day is better placed for dealing with the London Water Companies than the last Government of Lord Beaconsfield. The London County Council now stands ready to take possession of the water supply; so rendering unnecessary the creation of a "Water Trust." In the next place, the purchase-money can be raised at a much lower rate of interest now than formerly. The financial arrangements which the writer of the article prefers in providing for the purchase of the undertakings and the redemption of capital, are discussed at some length. The prospect of a new supply being demanded by the popular voice is dwelt upon; and the Companies are admonished not to stand out too stubbornly on their "rights." They are cautioned as to "the rising temper of the Londoners," and the spread of "subversive ideas." They are told that ten years ago it would have been impossible to get the House of Commons to read the first time Bills like those introduced in the present session by the London County Council. The proprietors of water stocks are warned that "they will soon find out their mistake," if they think they are rendered secure by the defeat of the Progressive party at the polls in the recent election. The new Council, whatever the platform professions of its members, "will have to move along the path taken by the old, and may very well end in producing a scheme of purchase to be applied to the Water Companies more subversive of vested interests in its character than that of the late Council." Even something worse is thought possible. An outbreak of zymotic disease, or a failure of the supply through drought, might raise a clamour which would compel the Council, whatever its political composition at the time, to abandon all attempts to purchase the Companies' undertakings, and might induce that body to devote its energies to bringing an abundant supply of pure water to London from some remote region. These contingencies are suggested; and then follows the oracular remark: "We cannot feel at all sure that it may not even now be too late for these Companies to come to terms with the Council." But supposing purchase came to pass, what are to be the terms? The Companies may not hope for a price "which would compensate them to the full for their present income." The utmost they are to look for is an amount in 2½ per cent. stock at par equivalent to the market price of their stocks for an average of, perhaps, the last five years. If they wait till another County Council election comes round, or until theories of "Stateism" have made further progress in Parliament, "they will not get that." The Companies are bid to read the handwriting on the wall, and to prepare for a surrender. Notwithstanding all the legality of their position, and their unquestionable rights, the Companies are advised to "agree with their adversary quickly," lest, if they miss the passing opportunity, they may see their property "confiscated," or bought up at the valuation of "old materials."

The "rights" and "dangers" of the Metropolitan Water Companies are thus skilfully set forth, the writer of the article playing the part of the candid friend. But is it so certain that London is prepared to see its water supply pass into the hands of the County Council? The article in the *Investors' Review*, fair as it is in some respects, is purely alarmist in its tone, and seems specially intended to frighten the Companies into an attempt to "come to terms with the Council." We would advise the Companies to put their trust in Parliament rather than in the authorities at Spring Gardens. The article in which the Companies are urged to the adoption of a panic policy has a singular reference to the future, as if some few years might intervene before an actual crisis occurred, unless the Companies could be cajoled or scared into precipitating the question by some procedure of their own. According to appearances, the present session should end the controversy, by a bold and comprehensive "transfer." Yet other changes may intervene, and set aside for a time this which to some observers appears so imminent. If "the rising temper of the Londoners" threatens the Water Companies, in no less a degree does it operate against the Progressives. The political element which characterizes the Council, however advantageous for the present, may also be found a source of weakness whenever a change of Government sets in. The Council and the Cabinet may not always be in harmony with each other; and a political alliance may not always serve as a convenient weapon in the hands of the municipal authority.

NOTES.

M. Berthelot on the Combination of Argon with Benzene.

M. Berthelot has made a special study of a sample of argon supplied by Dr. W. Ramsay, with a view to ascertaining its capacity for combining with other elements under the influence of the silent electrical discharge. He has communicated his results to the *Comptes Rendus*, and these go to demonstrate that the quality of inertness ascribed to argon by its discoverers must be modified in favour of the attractiveness exhibited for it by benzene. The conditions of M. Berthelot's experiment consisted in the employment of apparatus already described by him, in which a gas can be subjected to the action of the silent electrical discharge with variable potential, regulated by Ruhmkorff's apparatus, with a vibrating conductor and high tension. It was under such conditions that M. Berthelot succeeded in causing free nitrogen to be rapidly absorbed by hydrocarbons, hydrates of carbon, and the most diverse organic matters. In the presence of vapour of benzene, which is very effective in the case of nitrogen, argon is acted upon by the silent discharge with the accompaniment of a faint violet glow, visible in darkness. On one occasion, out of five experiments, there was formed at the end of some time a fluorescent body, which gave out a magnificent greenish light and a special spectrum. In the end, after several trials, benzene condensed 83 per cent. of the argon in the state of chemical combination produced by the silent discharge. The products of this combination represent too small a weight to permit of a detailed examination. They resemble the products of the silent discharge acting upon nitrogen mixed with benzene; that is to say, they consist of a yellow, resinous, odorous matter condensed on the surface of the two glass tubes between which the electric action is exerted. This substance, submitted to the action of heat, decomposes; forming volatile products, and leaving a bulky carbonaceous residue. The volatile products of decomposition are alkaline. In any case, M. Berthelot says, the conditions under which argon is condensed by hydrocarbons tend to assimilate it still closer to nitrogen. M. Berthelot suggests that if it is permissible to raise the molecular weight of argon to 42 instead of 40, this weight would represent one-and-a-half times that of nitrogen; that is to say argon would bear to nitrogen the same proportion that ozone does to ordinary oxygen, with this fundamental difference, that argon and nitrogen are not transformable into each other. M. Berthelot thinks that, when more considerable quantities of argon are obtainable, it will doubtless be easy to realize combinations with it which will form the starting-point of further transformations.

Two Suggestions in Photometry.

Two suggestions in photometry have recently been made public—neither of them being absolutely novel. At the recent Cleveland Convention of the National Electric Lighting Association of America, Messrs. Houston and Kennelly described an arrangement for measuring illumination based upon the principle that the degree of lighting received upon a surface, such as a printed page, must have a definite value in order to render the printed characters just legible; and that the intensity of illumination so required will, for a normal eye, depend upon the size and character of the type. In the application of the principle, a small printed tablet is enclosed in a darkened box and exposed to be lighted from a translucent plate of glass or thin porcelain, which receives directly on its surface the illumination which it is desired to measure. The area of the plate is then varied until the amount of light received by the test tablet just renders the characters legible; and the degree of illumination is then read from a scale—this being a function of the area of the plate exposed to the source. The other suggestion is that of M. Georges Lemoinne, to the Académie des Sciences, with reference to the observed phenomenon of the decomposition by light of mixtures of oxalic acid and ferric chloride. It is proposed to use this as a measure of the luminous intensity, because it is observed that the rapidity

of the chemical action depends directly upon the amount of light received by the mixture. The author finds that the liberated heat does not disturb the results, and that the decomposition ceases immediately upon the obscuration of the light. Changes in the intensity of any light-source may be watched in operation in this way. Thus it is recorded that the natural light of the sun in summer, after passing through a screening solution of potassium chromate 25 mm. thick, varied from 0·001 to 0·007. Further experiment is, however, desirable in this connection.

The Spectrum Top.

Writing to *Nature* on the curious phenomena exhibited by the spectrum top, in which black and white markings give, when revolved, an impression of colours, Mr. Dawson Turner describes an arrangement constructed by Mr. T. J. Walls, of Edinburgh, by means of which the effects in question may be shown upon a screen to a large audience. The markings are painted on a disc of glass, placed in a projecting lantern, and revolved by a multiplying wheel. A great variety of effects are producible in this way by interposing coloured glasses in the path of the beam of light. Thus, with a green glass, and in diffused gaslight, the dark marks appear mauve coloured when suddenly stopped after rapid rotation, or when very slowly rotated, but become of a dark blue when the gas is turned off. On rotating the disc in the usual way, the lines upon it appear to be blue, green, and violet. With a blue glass in gaslight, the markings on the disc appear to be yellow when suddenly stopped, but a fine purple without diffused light. The colours given by the lines at a moderate rate of speed are red, grey, green, and blue. With a monochromatic red glass, the lines appear to be blue, grey, red, and dark red. The appearance of blue by red light is remarkable. Mr. Benham, the inventor of the top, thinks that the phenomena of colour presented by it have nothing to do with the wave theory of light, but are purely subjective. It has been suggested that they are due to visual fatigue on the part of the observer.

The Perception of Colours in Coloured Light.

Experimenting on the perception of colours by light of various tints, Herr H. W. Vogel has found some very interesting results, which have been communicated to the Berlin Physical Society. Using oil-lamps provided with pure red, green, and blue shutters, Herr Vogel observed that, when white light was rigorously excluded, all sense of the colour of objects disappeared from the perception of the observers, who could distinguish nothing but shades of black and white upon the illuminated objects. It was further noted that a scale of colours illuminated by red light showed the red pigments as white or grey, which abruptly changed into yellow—not red—upon adding blue light. Hence a colour appeared which was not contained in either of the sources of illumination. Red and yellow patches appeared to be of the same colour, so that they could hardly be distinguished from one another; but the difference at once appeared upon the addition of green, instead of blue light. The kind of sensation experienced also depends very much upon the intensity of the illumination, as is easily seen in and about the region of the spectrum near the G line of Fraunhofer. This region appears violet when of low luminosity; blue when it is stronger; and may even appear of a bluish-white with strong sunlight. So that the often-made assertion that with normal eyes a definite colour sensation corresponds with a define wavelength, is not tenable. Herr Vogel arrives at the conclusion that our judgment of the colour of a pigment is guided by our perception of the absence of certain constituents. Thus a red tint is only recognized as such when light of other colours is used, and we perceive its inability to reflect these. The observations bear directly upon some phenomena of photography and photometry.

A Handsome Bequest.—The town of Kendal has recently lost by death one of its greatest benefactors in the person of its Mayor, Alderman Bindloss. His munificence and the benefits which he conferred upon the town during his lifetime will long be remembered; but it now transpires that his previous generous actions have been eclipsed by a large number of very handsome bequests—among which stands the sum of £30,000 to the Corporation of Kendal towards the cost of the new water-works.

A Laboratory Burner for Oil Gas.—Herr J. Spüller, of Kladno, in Bohemia, describes in the *Chemiker Zeitung* a form of Bunsen burner he has devised for the smokeless consumption of rich oil gas. The orifice whence the gas issues is only about 0·035 inch in diameter; while the tube of the burner up which the requisite supply of air is drawn has a diameter of 0·45 inch. This tube is not, as in the ordinary Bunsen burner, directly attached to the base, but is clamped to a vertical rod; and the size of the space available for the admission of air is regulated by simply raising or lowering the clamp. When the gas supply is checked, lighting-back is prevented by lowering the tube, and consequently diminishing the size of the air-inlet. It is necessary, in order to obtain the best results, that the gas should be supplied at a pressure of 2½ inches by a water-gauge. This atmospheric burner has worked excellently in the inventor's laboratory for some time past.

TECHNICAL RECORD.

THE CAUSE OF LUMINOSITY IN THE FLAMES OF HYDROCARBON GASES.

By Professor Vivian B. Lewes, F.I.C., F.C.S.

[A Paper communicated to the Royal Society, through Professor Thorpe, and read by the Author on March 21, 1895.]

In a paper read before the Chemical Society in 1893, I showed that, in the inner non-luminous zone of a flame of ordinary illuminating gas, the hydrocarbons originally present in the gas, and consisting of ethylene, butylene, benzene, methane, and ethane, became converted by the baking action of the walls of flame between which they had to pass into acetylene; and that, at the moment when luminosity commenced, over 80 per cent. of the total unsaturated hydrocarbons present consisted of this compound. The presence of acetylene at the point where luminosity commenced, naturally suggested that it was in some way due to actions in which the acetylene played the principal part—either that it split up into carbon and hydrogen under the influence of heat, and so supplied the flame with the solid particles necessary, according to Sir Humphry Davy's theory of the cause of luminosity, or else by its polymerization it formed the dense vapours required by Dr. E. Frankland's more recent hypothesis.

In order to elucidate this point, I carried out the long series of experiments upon the action of heat upon flowing ethylene and other hydrocarbons which formed the subject of communications to the Royal Society in 1893 and early this year, in which I showed that, while flowing through a heated area (the temperature of which was between 800° and 1000° C.), ethylene decomposed according to the equation $3C_2H_4 = 2C_2H_2 + 2CH_4$; and that the acetylene then polymerized into a large number of more complex hydrocarbons, amongst which benzene and naphthalene were conspicuous, while at temperatures above 1200° C., no polymerization took place, but the acetylene formed from the ethylene decomposed at once into carbon and hydrogen, while the methane, which up to this temperature had been but little affected, decomposed into $2CH_4 = C_2H_2 + H_2$; and this fresh supply of acetylene at once broke up to carbon and hydrogen, so that at temperatures above 1200° C. the complete action might be looked upon as being $C_2H_4 = C_2 + 2H_2$.

These results have an important bearing upon the cause of the luminosity in the flame, as it is manifest that, if the temperature of the luminous zone is above 1200° C., the light emitted must be due to incandescent particles of carbon, and not to incandescent hydrocarbon vapours.

On determining the temperature of an ethylene flame while burning from a small fishtail burner by means of the Le Chatelier thermo-couple, used in the way described in my paper on the luminosity of coal-gas flames,* I found that the temperatures were as follows:—

Portion of Flame.	Height above Burner.	Temperature.
Non-luminous zone	½ inch ..	952° C.
Commencement of luminosity . .	1¼ „ ..	1340
Top of luminous zone	2 „ ..	1865
Sides of luminous zone	— ..	1875

Showing that luminosity commenced with 1340° C., and continued even at 1875° C.—temperatures at which the incandescent vapour theory becomes untenable.

It might be urged that the heavy hydrocarbons already produced at a lower temperature in the non-luminous zone, are not so easily decomposed by heat as acetylene; and that these may be causing the luminosity, even though carbon particles be present from the decomposed acetylene. But this would hardly be possible, as so little besides acetylene is to be found at the top of the non-luminous zone of an ethylene flame; and it can be experimentally shown that even when benzene vapour is formed, and is largely diluted, it begins to break up and deposit carbon at 1200° C.

The supporters of the "solid particle" theory of luminosity agree in concluding that the liberated carbon—existing, as it does, in a condition of molecular division—is heated to incandescence partly by its own combustion, and partly by the combustion of the hydrogen and carbon monoxide going on around the finely-divided carbon particles. As has been pointed out by many observers, it is clear that the carbon particles themselves undergo combustion. Otherwise they would escape unburnt from the flame; while it is manifest that the combustion of hydrogen and carbon monoxide, which plays so important a part in the flame, must add its iota to the temperature attained by them. Both these sources of temperature, however, would be manifest in the flame itself; and with flames of given size, burning from the same description of jet, we ought to find that their luminosity is governed by—

(A) The temperature of the flame.
(B) The number of carbon particles in a given area.

Moreover, we should expect that the higher the temperature of the flame, the whiter would be the light emitted; so that a comparatively low-temperature flame, even when rich in carbon particles, would be yellow and lurid as compared with a flame

* *Chem. Soc. Journal*, 1893.

containing the same or a smaller number of particles, but which had a higher temperature.

It has been pointed out by Professor A. Smithells* that it is erroneous to consider the temperature of a flame as being the temperature recorded by thermometric instruments inserted into the flame; as by such devices you only obtain the mean temperature of a considerable area of the flame uncorrected for loss from conduction. It is also perfectly well known that in a flame a thick platinum wire may only be heated to redness, while a thin wire may even be fused. This suggests that flame temperatures taken by the Le Chatelier thermo-couple of platinum and platinum-rhodium wires may be totally incorrect. In using this beautiful and convenient device, I have found that the length of the wires twisted together made practically no difference in the recorded temperature, and that one twist was as good as six. In all my flame experiments, I have made the twist as short as possible; and, by always using wires of the same thickness, I have obtained results which are at any rate comparable if not correct. In order to find what difference the thickness of the wires would make, I got Messrs. Johnson and Matthey to draw for me wires of 0·018, 0·011, and 0·003 inch diameter; and having calibrated the galvanometer scale for temperature with thermo-couples of the same length of twist made from each of them, I obtained the following results with the same portion of a Bunsen flame:—

Wire Used.	Temperature Shown.
0·018	1617° C.
0·011	1728
0·003	1865

These results show that the diameter of the wire seriously affects the temperature recorded under these conditions by the thermo-couple; the same degree of heat being recorded by the fine wire as being 248° hotter than is shown by the thickest wire employed—this discrepancy being probably chiefly due to loss by conduction.

In taking the temperature of heated gas flowing through a tube, this source of error is but small; as some considerable length of wire being heated on each side of the twist, conduction has but little effect on the thermo-couple itself. But in determining the temperature of flames, it is manifest that the finest usable wire must be employed, in order to reduce the error from conduction. Test experiments also showed that no part of the thermo-couple must project beyond the flame; as, if it did, a considerable diminution in the recorded temperature took place. For these reasons, it was manifestly best to use the finest wire which could be employed without the risk of fusing at the temperatures existing in the flames to be tested. All temperatures recorded in this paper were made with wire 0·011 inch in diameter—the twist being as short as possible; so that it is probable that, although the temperatures may be from 100° to 200° too low, yet the results are strictly comparable.

Experiments which I have lately made with pure acetylene, prepared by the action of water upon calcic carbide, shows it to be the most powerful illuminant to be found among the gaseous hydrocarbons, as when burnt in a small flat-flame burner under the most suitable pressure, and its illuminating power calculated to a flow of 5 cubic feet an hour, its value is equal to about 240 candles. The colour of the flame is pure white; and an ethylene flame beside it looks yellow and dull—the purity of the light at once suggesting a very high condition of incandescence in the particles of carbon present in the flame.

On now taking the temperature of the various portions of the flame, and comparing these with the temperatures obtained in the same way with the ethylene flame and a coal-gas flame of the same size, the following results are obtained:—

Portion of Flame.	Acetylene.	Ethylene.	Coal Gas.
Non-luminous zone	459° C.	952° C.	1023° C.
Commencement of luminosity.	1411	1340	1658
Near top of luminous zone.	1517	1865	2116

The illuminating value of the gases calculated to a flow of 5 cubic feet an hour in the burners best suited for their consumption, are—

Acetylene	240·0
Ethylene	68·5
Coal gas	16·8

If all were compared when burning from flat-flame burners of the same size as those in which the temperatures were determined, the results, when calculated to a consumption of 5 cubic feet an hour, would be—

Acetylene	211·0
Ethylene	31·5
Coal gas	nil.

Here then we have the anomaly of three gases, which not only do not conform to the preconceived expectation, but which have their ratio of temperature and illuminating value directly opposed to each other. In the case of the acetylene and ethylene, moreover, the molecules contain the same number of atoms of carbon; and yet we obtain so enormous a discrepancy in their illuminating value.

The fact that there is no apparent relation existing between the temperature of the flame, or the probable number of carbon particles contained in it, and its illuminating value, at once suggests that the luminosity must be in great part governed by some thermo-chemical changes taking place in the flame itself, and which do not of necessity affect the average temperature of the flame to any great degree.

The researches of Hittorf* and Siemens show that air, steam, and the oxides of carbon, even when heated to temperatures above those existing in luminous hydrocarbon flames, are perfectly non-luminous; and the fact that the Bunsen flame, when supplied with sufficient air, has a temperature exceeding 1800° C. in its hottest part, and yet emits no light, shows us that it is exceedingly unlikely that any interactions leading to luminosity take place amongst these ordinary flame gases.

The fact that most of the unsaturated hydrocarbons in the flame are converted into acetylene before luminosity commences, naturally draws one's attention to this body; and the fact that it is highly endothermic at once suggests the idea that it may be the liberation of heat during its decomposition that endows the carbon particles produced from it with an incandescence far higher than any which could be expected from the temperature of the flame.

Berthelot has calculated that the temperature developed by the detonation of acetylene at constant volume is no less than 6220° C.; and if this be imparted at the moment of its liberation to the products of its decomposition, the incandescence of the carbon particles is at once explained. If luminosity be even partly due to this cause, the detonation of pure acetylene first recorded by Berthelot should develop light; and, in order to see if this were so, a thin glass tube, closed by a cork, had a detonator containing one-tenth of a gram of mercuric fulminate suspended in it by two copper wires. These were connected by a thin platinum wire in contact with the fulminate; and, on firing the detonator by the electric current, the flash of the fulminate was found to emit but a feeble light.

The same charge was fixed in a similar tube filled with pure acetylene collected over mercury; the result being a flash of intense white light and the shattering of the tube, the pieces of which were thickly coated with the carbon produced by the decomposition of the acetylene. Moreover, the small piece of white tissue paper used to contain the fulminate was only scorched at the points where the explosion of the fulminate had burst through it—showing that, in the instantaneous decomposition which had taken place, the intense heat which had been developed either was confined to the products of decomposition, or else had not had time to scorch the paper.

The experiment, at first sight, seemed conclusive evidence that it was the endothermic nature of the acetylene which, during its decomposition in the flame, endowed the particles of carbon with the necessary incandescence. But the objection presented itself that, when exploding mixtures of oxygen and hydrogen in the eudiometer, a distinctly luminous flash is produced; and, although the light so obtained is feeble as compared with the intensity of the white light produced by the detonation of the acetylene, still further proof is necessary before this action can be accepted as the prime factor in producing luminosity. It is also manifest that it would not do to assume that the rapidity of the decomposition of the acetylene in a flame was nearly so great as when the undiluted gas was detonated; and the question arose as to whether it would be possible to obtain evidence as to acetylene, when exposed to heat alone, liberating carbon in a luminous condition.

Although the instantaneous liberation of heat on the decomposition of the gas by detonation appears to confine the temperature to the products of its decomposition, it was to be expected that, on being decomposed by heat (and probably, therefore, at a slower rate), the increase in temperature might be detected. To try this, pure acetylene was passed through a platinum tube 2 mm. in diameter and 40 cm. long, in which the Le Chatelier thermo-couple was arranged as follows: The two wires were twisted together for a length of 3 mm.; and the wires on either side of the twist are then passed through thin glass tubes, which are fused on to them. Having been in this way coated with glass, so that only the twist is exposed, they are passed through the platinum tube—the glass insulating the wire from the metal of the tube, and also keeping the thermo-junction in such a position that it registers the temperatures of the gas in the tube, not that of the wall of the tube. To each end of the platinum tube glass, T-pieces are fitted, down the stems of which the wires pass to mercury seals; and, from the metal seals, conducting wires lead to the resistance coils, the key, and a reflecting galvanometer.

A steady flow of acetylene was allowed to pass through the tube, and was led into water at the other end. The tube was slowly and carefully heated for about 4 inches of its length; and, as the temperature reached 700° C., white vapours began to flow from the tube. These, as the temperature rose, increased in quantity. The source of heat had been so regulated that the temperature had risen about 10° per minute; but, almost immediately 800° C. was passed, the galvanometer registered a sudden leap up in temperature to about 1000° C., whilst finely-divided carbon poured from the tube.

This seemed to indicate that 800° was about the temperature at which the pure acetylene broke up into its constituents; and an experiment was now made to see if this developed incandescence in the liberated carbon. A small glass combustion tube was well supported, and heated to the highest temperature attainable with one of Fletcher's big blow-pipes, while pure acetylene was slowly flowing through it. The heating was

* *Phil. Mag.*, 1894, p. 249.

* *Wied. Ann.*, Vol. VII., pp. 587, 591.

not commenced until the tube was filled with the pure gas; all air being thoroughly rinsed out. As the temperature reached the softening point of the glass, the acetylene apparently burst into a lurid flame at the point where it entered the zone of heat; and clouds of carbon swept forwards through the tube. But, although the carbon particles had to traverse an inch or more of tube more highly heated than the point of entering the hot zone, it was only at this latter point that the luminosity was developed; proving beyond doubt that it was the heat evolved by the decomposition, and not the external heating, which caused the carbon particles to emit light.

If it is the decomposition of the molecule of acetylene which develops the heat which is the cause of the incandescence of the carbon particles, then, if acetylene could be burnt without decomposition, a non-luminous flame should be produced. It is conceivable that this might be done by so diluting the acetylene that it would require a much higher temperature to break it up.

It was Heumann who showed* that hydrocarbon gases may burn with luminous flames—*i.e.*, with separation of carbon in the flame, or with non-luminous flames—*i.e.*, without any separation of carbon, and that the maintenance of a high temperature is an essential condition of luminosity; a flame, the temperature of which has been lowered by any means, being no longer able to bring about the required separation of carbon. He also points out† that "combustible matter, when diluted with indifferent gases, requires to be maintained at a higher temperature, in order that it may burn with a luminous flame, than when it is undiluted with such gases."

Dr. Percy Frankland, in his researches on the effect of diluents upon the illuminating value of hydrocarbons,‡ showed that ethylene, which was capable of developing a light of 68·5-candle power when burnt by itself, became non-luminous when diluted with about—

Hydrogen	90 per cent.
Carbon monoxide	80 ,,
Carbon dioxide	60 ,,
Nitrogen	87 ,,

Results which all show that excessive dilution by inert gases destroys luminosity.

In order to see if dilution had the same effect upon acetylene, experiments were made by diluting it with pure hydrogen. The gases were mixed over water; the proportion of acetylene actually present in the gas being determined by analysis at the burner, as, although the water in both holder and meter was, as far as possible, saturated with the gas, yet, as the analyses show, the precaution was an important one—

Composition of Mixture.				Illuminating Value of Mixture per 5 c.c. when Burnt in 00 Bray.
Made in Holder.		At Burner.		
Hydrogen.	Acetylene.	Hydrogen.	Acetylene.	
90 ..	10 ..	90·5 ..	9·5 ..	nil
80 ..	20 ..	81·5 ..	18·5 ..	1·8
70 ..	30 ..	65·5 ..	34·5 ..	14·0
50 ..	50 ..	43·5 ..	56·5 ..	87·0

Showing that dilution with between 80 and 90 per cent. of hydrogen rendered the acetylene non-luminous when the mixture was burnt from a burner suitable for the higher values of gas.

In order to determine the point at which luminosity was destroyed when consuming the mixture in a burner suited to develop the light from a gas of low illuminating power, the experiment was repeated, using a 3-inch flame burning from the "London" Argand, and also from a No. 4 Bray union-jet—the latter being employed, as it is difficult to determine the temperature in the Argand flame.

Analysis of Mixture.		Illuminating Value per 5 Cubic Feet.	
Hydrogen.	Acetylene.	Argand.	No. 4 Bray.
92·0 ..	8·0 ..	Not measurable.	
91·0 ..	9·0 ..	Not measurable.	
88·5 ..	14·5 ..	4·1 ..	1·7

So that luminosity would be destroyed in the Argand by dilution with about 90 per cent. of hydrogen, and in the No. 4 Bray with about 88 per cent.

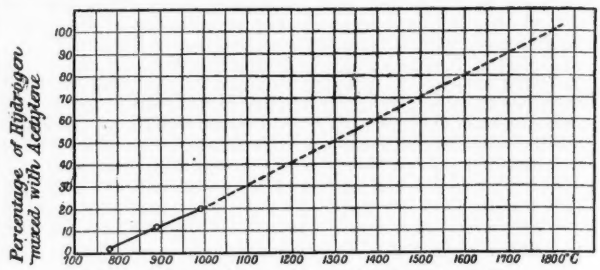
The next point to be determined was whether the destruction of luminosity in the diluted acetylene flame was in reality due to dilution, rendering it necessary to employ a higher temperature for the decomposition of the acetylene, or to other causes. In order to do this, a tube made of specially infusible glass, 4 mm. in diameter, was taken; and the Le Chatelier thermo-couple was fitted into it in the same way as before. Used with the platinum tube, and all air having been rinsed out by a current of the mixture to be experimented with, the gas was allowed to pass at a steady rate of flow through the tube; the point at which the thermo-couple was situated being steadily heated by the Fletcher blow-pipe, while the temperature recorded on the scale was noted the moment that incandescent liberation of carbon commenced.

Percentage Composition of Gas.		Temperature Necessary to cause Deposition of Carbon with Luminosity.
Acetylene.	Hydrogen.	
100 ..	0 ..	780° C.
90 ..	10 ..	896
80 ..	20 ..	1000

* *Liebig's Annalen*, Vol. CLXXXIII., Part I, pp. 102–131.

† *Ibid.* ‡ *Chem. Soc. Jour.*, Vol. XLV., pp. 30, 227.

It was found impossible to obtain a glass tube which would stand temperatures higher than this. But on plotting out the points so obtained, and which give a fairly straight line, it is seen that, even if the increase in temperature only continues for increased dilution in the same ratio as shown in the experimental determinations (which is extremely unlikely), the reason of the destruction of luminosity in highly-diluted hydrocarbon gases is at once explained, as an increase of each 10 per cent. in the dilution would necessitate an increase of 100° C. in the temperature of the flame, and with 90 per cent. dilution a temperature of over 1700° C. would be required to bring about decomposition.



Temperature required to decompose Acetylene with Separation of Luminous Carbon

FIG. 1.

My reason for believing that it is highly improbable that, when dilution is great, it only requires the same increment in temperature to bring about decomposition as when the dilution is small, is that in all the work done on the effect of diluents upon luminosity, and also in Professor Percy Frankland's researches upon the same subject, dilution with hydrogen and carbon monoxide acts regularly, and decreases the value of the illuminant in a direct ratio down to about 50 per cent., while when the degree of dilution exceeds 60 per cent., a rapid falling away in the luminosity takes place—a fact which I think points clearly to a regular *pro ratâ* rise of temperature being needed for increase in dilution up to between 50 and 60 per cent., while higher degrees of dilution need a far greater rise of temperature in order to bring about decomposition. Moreover, it would be manifestly incorrect to look upon the percentage of acetylene present in the gas issuing from the burner as being any guide to the degree of dilution existing at the point at which luminosity commences. As the two small streams of gas issuing from the holes in the union-jet meet and splay themselves out into the flat flame, they draw in with them a considerable proportion of air; the quantity being governed by the pressure of the gas at the burner.

This can be clearly seen by the fact that a high-value gas, which burns from a union-jet burner of a given size with a smoky flame, under a gas pressure of $\frac{1}{2}$ inch of water, will burn with a bright, smokeless, and rigid flame of greatly increased illuminating value when the pressure is raised to 2 inches; whilst an ordinary coal gas of 16-candle value must be burnt from a flat-flame burner at a pressure of about $\frac{3}{4}$ inch if the best results are to be obtained—the increase in air drawn in, if the pressure rises to a much higher degree, diminishing the illuminating value. Then, again, the area of non-luminous combustion in a mixture of gases like coal gas means that some at least of the hydrocarbons are consumed before the required temperature for their decomposition is reached; while the products of combustion formed in the lower part of the flame are mixed with the flame gases, partly by diffusion and partly by being drawn into it by the upward rush.

When a simple hydrocarbon like ethylene or acetylene is burnt alone, the whole of the heat required to bring about the decomposition has to be generated by the combustion (without decomposition) of a considerable proportion of the hydrocarbon; and this means considerable dilution at the spot where the luminosity commences. So that at the top of the non-luminous zone of an acetylene flame, there is only some 14 or 15 per cent. of acetylene present, diluted with nitrogen, hydrogen, water vapour, and the oxides of carbon; while, with a mixture of 10 per cent. of acetylene and 90 per cent. of hydrogen, in some cases little or no acetylene could be found at the top of the inner zone of the flame—it either having diffused with the hydrogen and been consumed, or polymerized to other compounds. It is manifest that the luminosity of a flame will be governed, not by the percentage of acetylene in the gas, but at the point at which the temperature is sufficiently high to bring about decomposition.

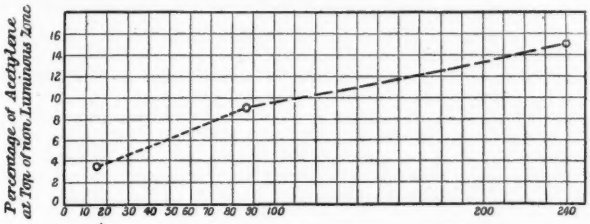
If, instead of making a mixture of 90 per cent. of hydrogen and 10 per cent. of acetylene, the hydrogen is burnt at the end of an open platinum tube, which has a fine platinum tube passing up the centre to the top of the inner zone of the flame, and if the acetylene be passed into the flame at the rate of one volume for every ten of the hydrogen, not only do we obtain an intensely luminous, but a very smoky flame. In this experiment, the gases were issuing from their respective tubes at the same pressure. But the small tube soon choked from deposited carbon; and it was found that the same results could be equally well attained by drawing down the inner tube to the

level of the hydrogen tube, and making the acetylene issue at a slightly higher rate of flow, which hurried it in a compact stream through the inner zone of the hydrogen flame.

In order to see if the percentage of acetylene present at the top of the non-luminous zone bore any ratio to the illuminating value of the mixture, experiments were made in which mixtures of hydrogen and acetylene were burnt at a small flat-flame burner; and the percentage of acetylene was determined by gently aspirating out some of the flame gases from the top of the non-luminous zone—

Analysis of Mixture.			Acetylene at Top of Non-Luminous Zone.	Illuminating Value of Flame for 5 Cubic Feet.
Hydrogen.		Acetylene.		
65·5	..	34·5	.. 3·72 ..	14·0
43·5	..	56·5	.. 8·42 ..	87·0
0·0	..	100·0	.. 14·95 ..	240·0

On plotting out these results, they certainly seem to point to the fact that, with flames of the same size burning from the same burner, the light emitted by the flame is directly proportional to the percentage of acetylene present at the top of the non-luminous zone of the flame, provided always that the temperature is sufficiently high to complete its decomposition.



Candle Power calculated to a Consumption of 5cf per Hour.

FIG. 2.

It is perfectly possible for the temperature of a flame to be so little above the point necessary to decompose the diluted acetylene that, while some decomposes and renders the flame faintly luminous, the larger portion burns without decomposition. A good example of this is to be found in the combustion of alcohol, the flame of which contains as much acetylene as is to be found in a good coal-gas flame, but which is practically almost non-luminous. If alcohol in a small dish be ignited, it burns with a faintly luminous flame; and if a bell-jar is placed over it, some of the products of combustion mingling with the flame still further cool it, and render it non-luminous. But if now a stream of oxygen be introduced under the bell-jar, the temperature of the flame is at once increased, and becomes highly luminous, while a cold porcelain vessel held in it is coated with soot.

In all the experiments in which light was developed in heated tubes by the decomposition of acetylene, the glow of the carbon was red and lurid; the light emitted being of the same character and appearance as that developed by the combustion of potassium in carbon dioxide, and entirely lacking the pure white incandescence of the acetylene flame as burnt from a flat-flame burner. This may be due to the fact that, in the open flame, the temperature of the carbon particles is presumably due to three sources of heat:—

(A) Heat derived from the decomposition of the acetylene molecule.

(B) Heat derived from the combustion of hydrogen, carbon monoxide, and some hydrocarbons in the flame.

(C) Heat derived from the combustion of the carbon particles themselves.

While in the tube experiments, the heat of the walls of the tube and the heat of decomposition alone are acting, it is evident that the intensity of the heat finding its way through the walls of the tube will be very different to that exercised by the walls of burning gas which enclose the luminous portion of the flame. There can also be but little doubt that the temperature of the carbon particles will vary enormously with the rate at which the acetylene decomposes; the more quickly the action takes place, the greater will be the localizing action upon the heat evolved, and the higher the incandescence of the carbon particles. That this is so seems certain from the whiteness of the flash of light emitted when the acetylene is detonated; and experiments were made so as to, if possible, gain an idea of how much incandescence of the carbon particles was due to the endothermicity of the decomposing acetylene, and how much to the action of heat and combustion on the carbon particles after formation.

In order to do this, a non-luminous flat flame of large size was desired, and was obtained by using coal gas de-illuminated by slowly passing it through bromine, well washing with sodic hydrate solution and water, and then passing it through strong sulphuric acid. The gas so treated had an illuminating value of 1·2 candles for 5 cubic feet when burnt in the "London" Argand at such a rate as to give a 3-inch flame, while in a fish-tail burner it gave a non-luminous flame. This gas gave on analysis the following percentage composition:—

Carbon dioxide	—
Unsaturated hydrocarbons	—
Carbon monoxide	5·50
Saturated hydrocarbons	33·28
Hydrogen	55·25
Nitrogen	5·49
Oxygen	0·48

So that its combustion would give practically the same temperature and flame reactions as those in an ordinary gas-flame.

A very fine platinum tube was now obtained, closed at one end, and with five minute holes bored in a line close to the sealed end; and this having been so arranged that the holes were buried in the flame just at the top of the inner zone, acetylene was gently allowed to flow through them into the flame. At the points where the acetylene issued into the flame, small areas of intense luminosity were produced; while the liberated carbon streaming up between the flame walls of the upper zone produced dull red bands of very low luminosity. It may be suggested that the carbon particles supplied in this way to the flame may have agglomerated, and formed masses larger than those produced in the ordinary way. But I do not think this, as they were completely consumed, and no smoke escaped from the crown of the flame; whereas if a flat flame is interfered with in such a way as to cause the carbon particles to roll themselves together, smoking of the flame is produced.

I think the inference to be drawn from this experiment undoubtedly is that it is the heat of decomposition which gives the high incandescence and light emitting value to the carbon particles; and that the temperature of the combustion of the other flame gases, and finally of the carbon itself, plays but a secondary part.

In considering these results, it seems remarkable, if acetylene owes its power of rendering hydrocarbon flames luminous to its high endothermic properties, that cyanogen (which is still more endothermic) should burn, under all conditions that have at present been tried, with a non-luminous flame—

Hydrocarbon.	Composition.	Heat of Formation.
Acetylene	C_2H_2 ..	− 47,770
Cyanogen	C_2N_2 ..	− 65,700

It is clear that, if the rapidity of decomposition localizes the heat evolved to the products of decomposition, and that this renders the liberated carbon particles incandescent, while the hydrogen plays at best a very subsidiary part, it ought not to matter whether it be hydrogen or nitrogen which is combined with the carbon.

Berthelot showed that cyanogen, like acetylene, could be detonated by a small charge of mercuric fulminate; but he notes that the test is not always successful. This points to the decomposition of this body requiring a greater expenditure of energy to break up the molecule than is the case with acetylene; and known facts would lead us to expect that this would be the case, as, although exothermic compounds become less and less stable with rise of temperature, endothermic bodies, on the other hand, become more stable. Also the endothermicity of cyanogen being greater than that of acetylene, would lead one to expect that temperatures which would decompose acetylene would have no effect on cyanogen; and that, as during the combustion of cyanogen the liberation of nitrogen would probably have a diluting and cooling action, the cyanogen would burn directly without liberating any carbon which could emit light.

In order to see if the temperature of the cyanogen flame when burnt from an ordinary flat-flame burner differed much from that of hydrocarbons when consumed in a flame of the same size and kind, the temperatures were experimentally determined by the same method employed, and in the same parts of the flame as had before been done with acetylene, ethylene, and coal gas.

Portion of Flame.	Temperature.
Centre of inner zone	1377° C.
Top of inner zone	2085
Near top of outer zone	1645

Showing that the cyanogen flame was actually hotter than the acetylene and ethylene flames, and about the same as the coal gas flame, but that the heat was differently distributed; the inner zone being far hotter than in the other gases, while the maximum temperature of the flame was at the apex of the inner zone, instead of being nearer the top of the flame.

An experiment was now made to ascertain if it were possible to decompose cyanogen with luminous deposition of carbon, by passing it through a hard glass tube heated by means of the blowpipe. But at the highest temperature attainable, no trace of any deposition of carbon took place; showing how far more stable cyanogen is under the influence of high temperatures than acetylene.

The structure and characteristic appearance of the cyanogen flame have been explained by Smithells* and Dent, who conclude that the inner zone of peach-blossom tint is caused by the combustion of the cyanogen to carbon monoxide and nitrogen, while the outer blue cone is formed by the oxidation of the monoxide to dioxide—the green fringe to the outer cone being attributed to the presence of small quantities of oxides of nitrogen. If this explanation be accepted, it is clear that we could not obtain luminosity in the portion of the flame immediately above the inner zone, as all cyanogen has been destroyed without decomposition before that point is reached. It is conceivable, however, that although no luminosity can be detected in a cyanogen flame, and although the temperature which can be obtained in a glass tube is insufficient to break up the compound with luminous separation of carbon, yet if cyanogen could be heated to a considerably higher temperature, it might be possible to decompose it in such a way as to develop luminosity.

* *Chem. Soc. Jour.*, 1894, p. 603.

In order to try this point, a hydrogen flame was burnt from the end of an open platinum tube 9 mm. in diameter; and a thin platinum tube 2·5 mm. in diameter was passed up through the broad tube to the apex of the inner zone, and a slow stream of cyanogen was admitted, with the result that the flame at once became luminous. On surrounding the hydrogen flame with an atmosphere of oxygen to increase the temperature, the luminosity was considerably increased.

This experiment at once explains the cause of the non-luminosity of the cyanogen flame, and shows that it is purely a question of temperature; and the probabilities are that, burnt in a flame which gave sufficient heat to rapidly decompose it, nearly as high an illuminating value as that of acetylene would be obtained.

I think the explanation of the apparent anomaly of the cyanogen flame having a higher temperature than the acetylene and ethylene flames, is to be found in the fact that the molecules of cyanogen are consumed without previous decomposition; so that the heat absorbed during the formation of the cyanogen is added to the heat of combustion, and raises the average temperature of the flame, whereas with acetylene the instantaneous decomposition of the molecule before combustion confines the heat evolved to the liberated products, and the average temperature of the flame is but little more than the heat of combustion.

If the luminosity of a hydrocarbon flame is principally due to the localization, during intensely rapid decomposition, of the heat of formation in the products, the illuminating values of such hydrocarbon gases as contain two atoms of carbon in the molecule should bear a simple ratio to their heat of formation. The gaseous hydrocarbons are—

Hydrocarbon.	Composition.	Heat Formation at Constant Pressure.
Ethane	C_2H_6	+ 25,670
Ethylene	C_2H_4	− 8,000
Acetylene	C_2H_2	− 47,770

And, although they may undergo many changes in the flame, they will all ultimately be reduced to carbon and hydrogen again before the full luminosity of the flame is developed.

When the acetylene into which these hydrocarbons is converted by heat is decomposed, the action takes place with such enormous rapidity that one would expect the heat evolved to simply divide itself among the liberated atoms, so that the question of specific heat at high temperatures may be omitted.

With exothermic compounds like ethane, considerable heat will have to be developed by its own combustion before it is converted into the acetylene which, by its decomposition, endows the flame with luminosity; and if we take the ethane and call its light-producing energy 1, we can then obtain a ratio of such energy for the other hydrocarbons available for distribution among the products of decomposition—

$$\text{Ethane} \quad \frac{25670}{25670} = 1{\cdot}00$$

$$\text{Ethylene} \quad \frac{25670 + 8000}{25670} = 1{\cdot}31$$

$$\text{Acetylene} \quad \frac{25670 + 47770}{25670} = 2{\cdot}86$$

These ratios must now be divided among the atoms liberated at the moment of decomposition from the molecule; and we thus obtain the ratio—

$$\begin{array}{cccccc} & C_2H_6. & & C_2H_4. & & C_2H_2. \\ & \frac{1}{8} & : & \frac{1{\cdot}31}{6} & : & \frac{2{\cdot}86}{4} \\ \text{or} & 1 & : & 1{\cdot}74 & : & 5{\cdot}72 \end{array}$$

The determination of the illuminating value of a gas becomes more and more difficult the higher its illuminating value, owing to the cooling effect of the small burners that must of necessity be used in order to ensure complete combustion. Dr. Percy Frankland* assigned the illuminating value of 35 candles to ethane as the mean of four tests, which varied considerably among themselves; and, adopting his figure, the calculated illuminating values for the ethane, ethylene, and acetylene would be—

Hydrocarbon.	Illuminating Value. Calculated.	Found.
Ethane	1·00 × 35 = 35·0	35·0
Ethylene	1·79 × 35 = 60·9	68·5
Acetylene	5·72 × 35 = 200·2	240·0

These figures are far nearer the experimental ones than could have been expected, considering the crude character of the calculation and insufficient data, which leads to omitting altogether such important factors as the amount of gas consumed to bring about the requisite temperature of decomposition, the specific heat of the products, and the thermal value of the change from gaseous to solid carbon, and are of no value except as showing that a ratio does exist between heat of formation and illuminating value.

Methane is the only other gaseous hydrocarbon of which the heat of formation is known; it being + 21,750. As the molecule contains only 1 atom of carbon, 2 molecules have to be taken; and on calculating the probable illuminating value by the same method as was applied to the other hydrocarbons, we should have—

$$\frac{25{,}670 + \left\{25{,}670 - (21{,}750 \times 2)\right\}}{25{,}670} \times 35 = 8{\cdot}4.$$

$$10 \times \tfrac{1}{8}$$

The illuminating value, as determined by Mr. Lewis T. Wright, is 5·2. But here, again, we know by experiment that methane requires a very high temperature to bring about its conversion into acetylene and decomposition into carbon and hydrogen; and that a large portion of the gas must be burnt without decomposition to do this.

The facts which I have sought to establish in this paper are—

1. That the luminosity of hydrocarbon flames is principally due to the localization of the heat of formation of acetylene in the carbon and hydrogen produced by its decomposition.

2. That such localization is produced by the rapidity of its decomposition, which varies with the temperature of the flame and the degree of dilution of the acetylene.

3. That the average temperature of the flame due to combustion would not be sufficient to produce the incandescence of the carbon particles within the flame.

In my paper on "The Action of Heat upon Ethylene," brought before the Royal Society this spring,* I showed that the decomposition of ethylene into acetylene and simpler hydrocarbons was mainly due to the action of radiant heat, and was but little retarded by dilution; while I have shown in this paper that the acetylene so produced requires a considerable increase in temperature to bring about its decomposition when diluted. It is possible with these data to give a fairly complete description of the actions which endow hydrocarbon flames with the power of emitting light.

When the hydrocarbon gas leaves the jet at which it is being burnt, those portions which come in contact with the air are consumed and form a wall of flame which surrounds the issuing gas. The unburnt gas in its passage through the lower heated area of the flame undergoes a number of chemical changes, brought about by the action of radiant heat emitted by the flame walls, the principal of which is the conversion of the hydrocarbons into acetylene, methane, and hydrogen. The temperature of the flame quickly rises as the distance from the jet increases; and a portion of the flame is soon reached at which the heat is sufficiently intense to decompose the acetylene with a rapidity almost akin to detonation. The heat of its formation, localized by the rapidity of its decomposition, raises the liberated carbon particles to incandescence—this giving the principal part of the luminosity to the flame; while these particles, heated by the combustion of the flame gases, still continue to glow, until finally themselves consumed. This external heating and final combustion adds slightly to the light emitted.

Any unsaturated hydrocarbons which have escaped conversion into acetylene before luminosity commences, and also any methane which may be present on passing into the higher temperatures of the luminous zone, become converted there into acetylene, and at once being decomposed to carbon and hydrogen, increase the area of the light-giving portion of the flame.

[My thanks are due to Mr. F. B. Grundy for the help he has given me in the work entailed by this paper.]

* *Chem. Soc. Jour.*, Vol. XLVII., p. 237.

Institution of Mechanical Engineers.—The general meeting of this Institution will be held on the 24th and 26th inst., at the Royal United Service Institution, Whitehall, under the presidency of Professor A. B. W. Kennedy, LL.D., F.R.S.

The Institution of Civil Engineers still continues to increase in numbers, although not at the same rate as in former years. The list corrected to the 1st inst. shows that there are now on the books 6737 members of all classes, as compared with 6557 in 1894. At the last monthly ballot for membership, Professor Elihu Thomson, of Lynn (Mass.), was elected a member.

West's Gas Improvement Company's New Catalogue.—We have received a copy of the new general catalogue issued by West's Gas Improvement Company, Limited. It consists of 166 pages of matter, printed on highly-glazed paper, and is altogether a very creditable specimen of letterpress printing. The Company, it may be remembered, have lately opened London offices in Queen Victoria Street, E.C.; and a view of the building in which they are situated forms a suitable frontispiece to the catalogue. The works at Manchester are illustrated by a general view and by 27 reproductions from photographs, whereby an excellent idea may be formed of the extent and capabilities of the vast establishment of which Mr. John West, M.Inst.C.E., as the Managing-Director of the Company, has the supervision. The largest section of the catalogue is necessarily occupied with the description and illustration of the Company's speciality, their retort charging and drawing machinery; but their other gas-works plant—comprising coke-breakers, conveying machinery, air-compressors, travelling cranes, &c.—is all fully and effectively presented. An index at the end facilitates reference to any appliance required. The book, which is oblong in shape, is neatly bound in cloth, gilt lettered; and it deserves a place on a gas manager's table alike for its contents and for the care and taste displayed in its production.

* See *ante*, p. 693.

REGISTER OF PATENTS.

APPLICATIONS FOR LETTERS PATENT.

6130.—Rippingille, H. V., "Gas and oil cooking stoves." March 25.
6133.—Bennett, R. G., "Radiant tissue for lamps." March 25.
6151.—Wildt, O. H., "Gas-engine." March 25.
6158.—Slocum, F. L., "Scrubbing or purifying gases." March 25.
6166.—Gautzsch, C., "Incandescence mantles or bodies for gas and vapour lamps." March 25.
6211.—Arndt, M., "Weighing gases." March 26.
6300.—M'Dougall, A., "Treatment of coal to adapt it for more economic use as fuel and in the manufacture of gas." March 27.
6333.—Zimer, F. W., "Attachments to gas-burners for heating and lighting purposes." March 27.
6383.—Southall, J., "Gas and oil motor engines." March 28.
6501.—Schroder, M., "Water-pipes." March 29.
6560.—Lawson, W., G., and W. H., "Couplings or unions for connecting pipes or tubes." March 30.
6585.—Douin, P., and Kestner, P., "Combustion of gaseous fuel." March 30.
6683.—Ayres, W. A., and Ranger, H. P., "Mechanical stokers." April 1.
6690.—Besson, A., "Incandescence gas-burners." April 1.
6696.—King, G., "Flanged pipe-joints." April 1.
6722.—Clouard, A., "Gas-producing furnaces." April 2.
6777.—Gearing, E., "Acetylene generating and storing apparatus." April 2.
6800.—Mackenzie, J. W., "Gas-engines and the like." A communication from H. M. L. Crouan. April 2.
6849.—Clerk, D., and Lanchester, F. W., "Gas and like engines." April 3.
6854.—Werner, J., "Connections for pipes or tubing for the supply of gas or other fluid." A communication from — Caldwell. April 3.
6870.—Sugg, D. W., "Incandescent gas-burners." April 3.
6873.—Holt, H. P., "Gas motor cars." April 3.
6933.—Dykes, A. H., and Handcock, H. W., "Water-pipes." April 4.
6947.—Demolder, F. F., "Preventing the formation of ice in water-pipes." April 4.
6952.—Ruden, E. G., and Noren, K. L., "An electrically opened and closed gas-burner." April 4.
6954.—Newman, S. J., "Preventing the bursting of water-mains through frost." April 4.
6972.—Donaldson, W., "Gas-motors." April 4.
6976.—Catling, J. T., "Cleaning gas-mains and such like conduits; in part applicable to the cleaning of hydraulic mains in gas-works." April 4.
6981.—Webber, W., "Coin-controlled gas-vending apparatus." April 5.
7042.—Defries, H., "Gas-burners." April 5.
7056.—Russell, D. K. C., "Thawing frozen water-pipes and their surroundings." April 5.
7113.—Bryson, J., Jones, J., and Fraser, W., "Retorts for the distillation of shale and other bituminous substances." April 6.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The "Workman-Director" Question.

Sir,—I naturally read with interest your successive articles on the "Workman-Director" question in connection with the South Metropolitan Gas Company, and share your desire to see the experiment tried, but not at the expense of the shareholders of that Company.

Now, Sir, seeing the importance you justly attach to it, could you not be induced to make the experiment in your own establishment? Why not start a profit-sharing scheme with your own staff and workmen; and then in a year or two, when successfully initiated, arrange for the election by them of one of their number to share once a week your editorial chair and the management of the Journal?

The Newspaper Press of this country is, we all know, even a more important diffuser of light than the Gas Companies; and who knows how wide reaching and beneficial the results of your experiment might be? It might even put courage into the faint hearts of the "common commercial" Directors of the South Metropolitan Gas Company, and induce them to follow your example. The only fear is that the experiment might prove so satisfactory that all your employees, and ours of the South Metropolitan Gas Company, might wish to become Directors, which might prove awkward. This, however, is perhaps only a detail which our experts would find a way to overcome.

4, *Fenchurch Street, E.C., April* 10, 1895. John Ewart.

[The suggestion made by Mr. Ewart is dealt with in our editorial columns to-day. On the subject of "Workmen-Directors," a lengthy letter came to hand from Colonel Makins, after to-day's number of the Journal was made up for press. It shall be given next week.—Ed. J.G.L.]

Some Suggestions on the Labour Problem.

Sir,—It must be universally admitted that the Labour Question, in conjunction with kindred matters, constitutes the most vital, complicated, and important topic of our time. Certainly it will have to be grappled with; and, to every appearance, that right speedily. The subject affects gas undertakings acutely; and it may, unless settled, become chronic. Everyone converses about it; and yet, of all questions seriously discussed in our meetings and periodicals, this one receives the least and the most scant attention. We are doing practically nothing to bring it either to a head or to a satisfactory issue. I therefore beg, through the medium of the Journal, to offer a few suggestions, and will, as I go along, pass a remark casually on each one being as brief as possible, that I may occupy but little of your space. They are as follows, viz.:—

The need of a cheap press advocating the cause of the workers, either in connection with existing periodicals or entirely independent. Our present excellent papers are indeed good and fairly sympathetic; but their price is beyond that of the general body of gas workers. There is little doubt but that this would pay, as the eagerness with which these people pounce upon and devour a stray copy of the Journal is remarkable.

The federation of the whole body of gas workers in the kingdom under one resolute, sagacious, and persevering man. This sounds a very large order, and incapable of being carried out; but if you think slowly, you will find that it is distinctly feasible.

Direct representation of employees on all boards—either municipal bodies or ordinary companies. This is a matter of right, policy, and justice; and the gratitude of all right-thinking men should be given for the effort that has lately been made in this direction.

Division of a percentage of profits among workpeople. This has I believe already been most successfully carried out in at least one notable instance; and it is universally applicable to gas companies, who invariably make profits, while as to those urban authorities who do not make sufficient money, the item might stand as any other item stands—such as carbonizing wages—on the debit side of the revenue account. If a deficiency should ensue to the concern, there are the rates to fall back upon; and as we have now got in the thin end of the wedge of graduated taxation, why lose time in driving this wedge thoroughly home to its legitimate place?

Retirement of workmen on reasonable pensions after (say) 25 years' service; authorities to pay their quota to this fund where men have been employed intermittently. There is nothing here to alarm the most timid. The scheme could easily be worked in connection with the profit-sharing clause. I would not make it compulsory on workmen to retire after this length of service, but give them the option of working on at their full wages until they had completed 30 years' service.

Time-and-a-half to be universally paid throughout the country to all workmen employed on Saturday afternoons, Sundays, and Sunday evenings. I mention this in these remarks, though the subject is one that might safely be left to the federation when formed; as this, along with other matters in connection with details of working, would doubtless attract their attention.

Public competitive examinations before any person is allowed to obtain the position of gas manager or engineer; no candidate to be eligible unless he has passed at least three years' service in the works themselves. This needs little comment, as the manner in which the important position of a gas manager is at present filled up is a crying evil, and very unsatisfactory to the profession. The man with a pleasing address is, as a rule, chosen; and in nine cases out of ten, this is the worst selection that could possibly be made.

Retirement of managers on fair pensions after reaching 60 years of age. This is moderation itself, and it is absolutely essential for the good of the industry. It is lamentable to see the number of elderly gentlemen occupying this position, who, while being completely behind the times, and knowing it, refuse, after having even "baked their cake," to budge one iota, and make room for younger and more enterprising men. They are a menace to gas companies, and the cause of much ill-will on the part of the consumers in many concerns.

The extension of the sliding-scale and the payment of gas managers by results. Of all the improvements introduced into gas-works management during the nineteenth century, that of the sliding-scale is the grandest and the best. The idea is simply magnificent; and the success which has attended it is truly wonderful. But if we are allowed to pay higher dividends in consequence of selling cheaper gas, surely we ought to be empowered to pay still greater dividends in the future by being willing to tackle and conquer this hideous sore, this cancer of the gas industry. Then as to payment of managers. Does anyone mean to say that the present mode is a good one, or that the best men get the best salaries? Yet there is no reason why the many really superior men should be underpaid by stingy directors or nauseous vote-hunting public representatives. Every manager should have a fixed salary, and should be given either a bonus or a percentage on his results, and according to the dividend payable, and not the dividend paid. I am glad to say that in my case this practically is so; and I have just received a handsome cheque from my employers, as a tangible proof of their good-will and esteem, with a wish for my future success. I may also say that I try to make my workmen and all about me happy. This is a very easy thing, if you go about it in a sensible way; and the result, once fairly obtained, has a great influence upon the profits of the concern. This is not mere assertion, but absolute fact; and I argue that it is possible to make any gas-works fairly agreeable or totally unbearable simply by the general habits and the disposition of the manager.

The conversion of all dividends into 4 per cent. maximum. There is not the slightest necessity for this to clash with the sliding-scale; and the result would be the removal of the existing deplorable ignorance of the public on this matter.

Regulation of the fees of directors. This is a subject which is in a very unsatisfactory state; for while many hard-working gentlemen receive a mere pittance for their labours and anxiety, others draw an exorbitant salary, and perhaps are actually standing in the way of the true progress of the undertaking.

Retirement of directors without perquisite or pension after ten years' service. I pass this without any remark. Some of your correspondents may perhaps kindly give their opinion on this question.

Gas in no case to be advanced in price without the direct sanction of the Board of Trade. The power to raise the price of gas, even under the pressure of exceptional circumstances, is a relic of barbarism. Take the late coal strike, for instance, when the whole community was suffering. Gas undertakings in many instances advanced their price, or, in other words, said literally: "No; we ourselves will not suffer, but we will make the public suffer more still."

The working up of residual products to be compulsory. This would be a great benefit to many works existing in "Sleepy Hollow;" as

even the very smallest might co-operate with this object, with the view to their great and lasting advantage.

Co-operation of gas undertakings for the mutual production of all materials required, including coal. This would be a great thing, and a boon to thousands. Take the coal trade, for instance. If we possessed collieries, we could not only pay tip-top wages, but could also keep the men employed all the summer through. It would be a source of great satisfaction in a district if we could supply during the light weather, to gas consumers only, coal at cost price. This would not only keep the men going, but would render us very popular indeed. This movement could besides be extended to an enormous degree in othe materials.

One standard burner only to be employed in England. The publication of the illuminating power of the gas at different works under totally different conditions so far as burners are concerned, is a farce. One undertaking gives tests of the 24-hole, another of the 15 round hole, and another of the 15 slotted hole burner. How can we compare these?

Responsibility for the pressure of gas supplied to cease only at the consumer's burner. This would necessitate the entire fitting up of houses, &c., by gas undertakings; and the sooner the better. What manager has not felt at times annoyed by being charged with selling bad gas, when the only fault has been the wretched fittings of the consumers?

All accounts of gas undertakings to be audited by the Board of Trade. This would prevent juggling, which, in my opinion, is very prevalent —far more so than is usually thought; though I am charitable enough to think that in many cases this is done quite innocently.

In conclusion, I trust these suggestions will lead to a discussion in the columns of the JOURNAL. An ostrich policy in 1895 is nonsense; and it is our duty to look the matter fairly and squarely in the face. My advice is to encourage the workers in forming a complete federation scheme. Make it as perfect as possible; and then form an offensive and defensive alliance with them. This would end in the permanent good of the shareholders, the lasting benefit of the consumers, and the settlement of the great problem of the age in our industry—the labour problem.

SENTINEL.

April 9, 1895.

Explosions in Purifiers.

SIR,—Will you find space for the following hint to my brother managers, *re* the above?

In works where lime is used for the purification of coal gas, it is of importance, when a purifier is thrown out of action, that the ventilation of the lime should be effected gradually, and not rapidly. Great care must be taken not to have too much vacuum on the exhauster used for drawing air through the lime; otherwise, if the inrush of oxygen be too rapid, the lime will be raised to so high a temperature as to ignite the grids—in all possibility causing an explosion of the dangerous mixture of gas and air.

STEPHEN CARPENTER.

Gas-Works, Bow Common, E.,
April 9, 1895.

A New Danger to Gas Companies.

SIR,—Will you allow me to draw the attention of your readers to the Bill for the amendment of the Borough Funds Act, 1872, recently introduced by Sir Albert Rollit? I lately saw a reference to it in the report of a meeting of the Association of Municipal Corporations. The point in Sir Albert Rollit's amendment to which I would specially refer, as one which might seriously affect gas and water companies, is this: In the existing Borough Funds Act, it is necessary, when a corporation promotes a Bill in Parliament, to submit it to a public meeting of the ratepayers; and one ratepayer can demand a poll. But Sir Albert Rollit's Amendment Bill proposes to repeal this provision of the Borough Funds Act; and, instead of giving power to one ratepayer to demand a poll, the amendment stipulates that it shall only be taken upon 10 per cent. of the ratepayers demanding it, and that no public meeting of the ratepayers shall be held. At all events, Sir Albert Rollit's amendment does not provide for such meeting, on the ground, as stated by one of the interested speakers—a Town Clerk—that it "could not serve any useful purpose." Sir Albert Rollit's object seems very clear. He is aiming at concentrating all legislative power within the hands of corporations, and so minimizing the power of ratepayers that, under his amendment, they will be practically helpless—reduced, in fact, to the condition of the subject in olden times whose political duty only required that he should "pray and pay."

The gist of the whole business lies in the power to demand a poll. I believe it is a fact that, where polls upon corporation matters have been demanded, according to the present Act, by one individual, they have always been representative of wide public opinion. But if polls are to be dependent on 10 per cent. of the ratepayers signing a requisition, the privilege will become a delusion; for who, under such circumstances, will initiate a poll, or undertake the work and cost of getting the necessary number of signatures to demand it? Then the Amendment Bill proposes that a poll shall only be taken at one place in a town or borough—say, at a town hall or other building—another condition which would be so inconvenient that the majority of ratepayers would not take the trouble to vote at all.

Now, as corporations are getting more and more filled with men who, practically, have but little interest either in property or in investments, their action towards gas and water companies is, as a rule, getting more and more harsh and unfair. The desire to municipalize public companies has become a craze with the class of men who now-a-days are in corporations; and therefore there is all the more need that the property classes should retain some power to protect themselves against hasty and partisan acts of municipal bodies. There is now scarcely an instance where corporations treat public companies with common fairness, and in many cases not even with the commonest business decency. As, perhaps, an extreme instance of the despotism of corporation conduct towards a gas company, take the conduct of the Corporation of Dublin towards the Alliance Company of that city. It is true the Corporation treatment of the Company has been called persecution; but I prefer to leave your readers to form their own opinion of it. I simply quote Dublin to show that what has taken place there may take place elsewhere; and, in fact, in a modified form, it has taken place elsewhere. I know of a case where recently a corporation were checked in their attempt to unfairly press a gas company to sell their works, by the fact that the town threatened to poll the ratepayers against the measure. But if Sir Albert Rollit's amendment had been law, the helter-skelter Fabian composition of the town council would have carried out its scheme of a kind of semi-confiscation of the company's rights.

My object, therefore, is to suggest that the Gas Associations should at once look into Sir Albert Rollit's Bill for the amendment of the Borough Funds Act, and induce gas companies all over the country to bring pressure upon Members of Parliament to prevent it becoming law. British investors frequently have cause to complain against the honesty of foreigners in their treatment of British capital. But home politicians are fast treading in the foreigners' footsteps; and many of them will soon be as little to be trusted. Many crimes have been done in the name of Patriotism, as many robberies now-a-days are committed in the name of Public Interest.

WARNING.

April 6, 1895.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the first time: British Gaslight Company (Staffordshire Potteries) Bill, Brymbo Water Bill, North Middlesex Gas Bill, Scarborough Gas Bill.

Bill read a second time and committed: Newmarket Gas Bill.

Bill reported without amendment: Newmarket Gas Bill.

Bills reported, with amendments: Edinburgh and District Water Bill; Merthyr Tydfil Local Board Water Bill.

Bills read the third time and passed: Edinburgh and District Water Bill; Newmarket Gas Bill.

HOUSE OF COMMONS.

Tuesday, April 9.

WATER CONSUMERS' COMPLAINTS.

Mr. BIGWOOD asked the President of the Local Government Board whether, in view of the fact that many suburban consumers of water living outside the London area, and supplied by London Water Companies, were still without a supply of water in consequence of the frost acting upon inefficiently laid mains, he would be disposed to introduce legislation affording protection to these people, or at least extending to them the right to demand an inquiry at present possessed by the householders in the more central districts of the Metropolis.

Mr. SHAW LEFEVRE: It appears to me that the same remedies should be given to consumers outside the London area supplied by the London Water Companies as to those within. But, before taking any action in this direction, it will be well to see what is the result of the inquiries in respect of the complaints made against the Companies from ratepayers within the area.

The following further progress has been made with Bills:—

Bills read the first time: Edinburgh and District Water Bill, Electric Lighting Provisional Orders Bills: No. 1, relating to Motherwell and Stirling; No. 2, relating to Alderley Edge, Leigh, Llandudno, Luton, Radcliffe, and Swindon New Town; No. 3, relating to Carlisle, Pontypool, Walthamstow, Winchester, and Worthing.

Bills read a second time and committed: Ambleside Urban District Council Gas and Water Bill, Bristol Water Bill, Felixstowe and Walton Water Bill.

Bills reported: Bristol Water Bill; Hayward's Heath Gas Bill.

Bills read the third time and passed: British Gaslight Company (Staffordshire Potteries) Bill, Brymbo Water Bill, North Middlesex Gas Bill, Scarborough Gas Bill, Whitby Water Bill.

General Goldsworthy (Hammersmith) has presented to the House the petition drawn up by the recent conference of delegates of Vestries and District Boards in the Administrative County of London with regard to the supply of gas (see *ante*, p. 650). The petition asks for an inquiry into the present management and working of the various Gas Companies supplying the Metropolis, and as to existing statutory rights and past results, financial and general, of the statutory sliding-scale of price and dividend. It is asked that the inquiry shall include the question as to obtaining an improved and uniform standard in the quality and illuminating power of the gas, with increased facilities for testing it at any station or place of supply, with the object of a Bill being subsequently introduced to provide for reducing the standard price and statutory limit of dividend now authorized to be charged and paid by the Companies, for instituting a uniform charge throughout the Metropolis for all gas supplied, to include the free use of meters, and for improving the standard of quality and illuminating power, and also the testing arrangements.

A petition praying for an inquiry into the management of the Metropolitan Water Companies has been presented from Ealing.

Swansea Gas Company.—At the annual meeting of the Swansea Gas Company a few days since, the Directors reported that, notwithstanding the depressed state of trade, the profits for last half year amounted to £7389; and the usual dividends of 10, 7½, and 7 per cent. on the various classes of shares were declared. The Chairman (Mr. Travers Wood) announced that it was proposed to reduce the price of gas from 3s. 2d. to 3s. per 1000 cubic feet to private consumers.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, April 9.

(*Before Mr. Justice* STIRLING.)

Saunders and Another v. The Incandescent Gas-Light Company and Others.

This motion, in which the plaintiffs sought to restrain the Directors of the Incandescent Gas-Light Company from carrying out a scheme of reconstruction as already reported in the JOURNAL (*ante*, p. 650), again came before the Court this morning.

Mr. ASHTON CROSS, for the plaintiffs, said Sir Henry James, his leader, had been obliged to return his brief on the previous day. Mr. Carson, Q.C., had been instructed, but had not been able to read the papers; and he asked that the motion might stand over till later.

Justice STIRLING inquired if there would then be time to dispose of the motion.

Mr. BUCKLEY said it would take a good while to read the evidence.

After some further discussion,

Mr. CROSS decided to open the motion, which, with the reading of the affidavits, occupied the greater part of the day.

Mr. CARSON, Q.C., then commenced the cross-examination of Mr. de Fonblanque, the Secretary of the Company.

At the time for rising,

His LORDSHIP intimated that he could not see his way to making any order on the materials which had so far been put before him.

It was ultimately arranged that the motion should stand over to the trial of the action.

CITY OF LONDON COURT.—Monday, March 25.

(*Before Mr.* E. B. TATTERSHALL, *Assistant-Registrar.*)

Thompson v. The East London Water-Works Company.

This was an action to recover from the defendants the sum of £1 11s. 3d., an alleged overcharge for water for a conservatory, at the rate of 5s. a year for 6¼ years. The case was before Mr. Commissioner Kerr on the 8th ult. (*see ante*, p. 544); one defence, it may be remembered, being that a portion of the claim was barred by the Statute of Limitations.

Mr. R. S. CUSHING appeared for the plaintiff; Mr. G. KEBBELL represented the defendants.

Mr. CUSHING briefly recapitulated the plaintiff's case; stating that Mr. Thompson entered into possession of his house, No. 31, Osbaldestone Road, Stoke Newington, in 1887. He became a consumer of the water supplied by the Company, and had satisfied their legal demands from that time to the present. In 1893, he ascertained that he had been overpaying the Company with respect to the alleged use of a conservatory. Correspondence ensued, with the result that the Company practically acknowledged the overcharge by ceasing to demand it. In evidence of this, he would put in the corrected statement of the Company, in which they had struck out the claim for the conservatory. The overcharge was at the rate of 5s. a year; and his claim against the Company was for £1 11s. 3d., less 10¾d., which would represent the 67 days covered by the statute, which was put in as defence. His case was that an illegal charge had been made, and had been admitted by the Company.

Mr. *Gill*, a collector in the service of the Company, who was called on a subpœna, identified the various demand-notes and receipts in relation to the water supply to the plaintiff's house.

In cross-examination by Mr. KEBBELL, witness stated that he remembered in 1887, when the house was for sale, a board being exhibited setting forth that among the other attractions of the premises was a conservatory. The charge for it then appeared in the Company's books for the first time. He visited Mr. Thompson's house one day early in March, and saw about a dozen flower-pots, with plants in them, in the conservatory.

Mr. KEBBELL: Is it not a fact that so very little water was used that the Company, as an act of grace, agreed not to charge for it?

Witness: That is the case in a nutshell.

Mr. CUSHING: In your examination of the conservatory, did you find any water-fittings?

Witness: No water-fittings.

The ASSISTANT-REGISTRAR asked if the parties agreed that the conservatory was, as stated in the correspondence, 12 ft. by 6 ft.

Mr. KEBBELL assented.

Plaintiff was then called, and briefly gave evidence in support of his case.

In cross-examination by Mr. KEBBELL, witness said he did not know about the board when the house was for sale, and could not say if the auctioneer's advertisement mentioned a conservatory. At any rate, the house had not one; it had what he (witness) called a lobby to a smoking-room.

Mr. KEBBELL contended that the examination and cross-examination of his friend's witness had put him out of Court, and that there was nothing to answer. The structure was such an one as came within the definition of a "conservatory."

The ASSISTANT-REGISTRAR: That is the whole point. Is it a conservatory, or is it not?

Mr. KEBBELL said the signification in Webster's Dictionary was: "A greenhouse for exotics, often attached to a dwelling as an ornament;" and the Act stated that a non-domestic supply included water for gardens, fountains, and ornamental purposes. He submitted that this was a conservatory for "ornamental purposes" within the terms of the section.

The ASSISTANT-REGISTRAR: Has there ever been a case in which a conservatory was mentioned?

Mr. KEBBELL: No, Sir; presumably because there was never a consumer mad enough to raise this question.

The ASSISTANT-REGISTRAR intimated that he would report to the Court in due course.

The report was subsequently received by the Company's Solicitors (Messrs. Kebbell and Miller); and it was in favour of the defendants.

Wednesday, April 3.

(*Before Mr. Commissioner* KERR.)

The case came before the Court again to-day for decision.

Mr. LE RICHE, on behalf of the plaintiff, protested against the finding of the Assistant-Registrar, who, he said, had no power to go into the law of the case as he had done. That was a question for the Court. The plaintiff had paid 5s. a year for water supplied to his conservatory, when, in the ordinary sense of the term, there was no such place. That which the Company regarded as a conservatory was a smoking-room, 12 feet by 6 feet; and the plaintiff had only about eleven plants in it. It was true that he watered them from time to time; but there was no water supply or fittings in the conservatory. He maintained that the use of a few jugfuls of water on the plants did not entitle the Company to the charge they had made.

Mr. KEBBELL said, according to his view, the public were not entitled to water their conservatories from a domestic supply. It was not using the water for a domestic purpose.

Commissioner KERR gave judgment for the defendants, and said he could not hold that using water in a conservatory was a domestic purpose; it was, in fact, a luxury. It was true the plaintiff said he had only had eleven plants in the conservatory; but there was nothing to prevent him using the water for 150.

Mr. LE RICHE asked for leave to appeal.

Commissioner KERR offered to grant leave if the plaintiff would consent to the costs being on the higher scale.

Mr. LE RICHE declined.

Judgment was then entered for the defendants, with the costs of three witnesses.

The Gaslight and Coke Company Fined for Sulphur Impurity.

At the Marylebone Police Court, on Monday last week, two summonses were heard against The Gaslight and Coke Company; the complaint being that on the 1st and 2nd of November, at the testing-place in Camden Street, Camden Town, the defendants had supplied gas of less purity than it ought to be under the statute. Mr. J. W. Godfrey prosecuted on behalf of the London County Council; and Mr. Beasley Robinson represented the defendants. As is well known, the winter limit of sulphur in gas is 22 grains. On Oct. 31 last, the gas was tested, and it was then found to contain sulphur to the amount of 14·9 grains. But tests were also made on the 1st, 2nd, and 3rd of November; when the results were 27·38 grains, 25·93 grains, and 18·47 grains. Mr. Robinson said the Company were extremely sorry for this excess of sulphur in the gas. It was the first case of the kind at the St. Pancras works; and every care was taken to keep the sulphur down. The cause of it was most difficult to ascertain. Mr. Plowden imposed a fine of 40s., and 12s. 6d. costs, in each case.

The Claim against the Grand Junction Water Company.

Judge Bagshawe, in the Brentford County Court, has given a written judgment in the case of *Moore v. The Grand Junction Water-Works Company*, referred to in last week's issue, p. 757. The plaintiff, it will be remembered, sought to recover from the defendants £7 15s., being £6 17s. 1d. for over-payments made for water supplied between October, 1887, and August, 1894, and 17s. 11d. interest thereon. Plaintiff took the house some time prior to 1887, when it was assessed at £48; and the Company charged him £1 19s. 6d. per annum—this sum being based on the assessment—for water supplied. In 1887, he (on appeal) obtained a substantial reduction in the assessment, but continued paying for water on the original assessment until 1894. when he discovered his non-liability to do so. He made representations to the Company, who reduced their rate to £1 1s. per annum, but declined to make any rebate. The defendants pleaded that they had no knowledge of the reduction in the assessment. It was, they contended, the duty of the consumer (of which they apprised him by notice on the demand-note) to notify any change; and the plaintiff, having neglected this, was not entitled to any rebate. The Judge said there was no evidence or admission as to how the value had been overstated; and it was not proved that the Company had knowingly and intentionally made any overcharge. He thought the mistake had been one of opinion and estimate, rather than one of fact. The plaintiff, of course, knew as much as, or more than, the defendants about the facts constituting the value of the premises; and he (the Judge) saw no reason for holding him entitled to sue for the amount paid on an over-estimate than there would be for holding the Company entitled to sue for an amount which, by reason of a mistake, they had failed to demand and receive. Be that as it might, the decision of the Queen's Bench Division (Lord Coleridge and Mr. Justice A. L. Smith), in *Henderson v. The Folkestone Water-Works Company*, bound him in deciding against the plaintiff, and also a similar decision in *Haines v. The New River Company*, by his late colleague, Judge Eddis, which was entitled to great weight. He dismissed the claim, with costs.

The Killarney Gas Company v. The Killarney Town Commissioners—Curious Proceedings regarding the Public Lighting.

At the Killarney Quarter Sessions last Friday week, before the County Court Judge (Mr. J. J. Shaw, Q.C.), a case which has attracted a large amount of interest in the town came on for hearing. The suit was that of a civil bill decree by the Killarney Gas Company, Limited, against the Town Commissioners for £46 5s., a half-year's payment for the public lighting of the town up to Dec. 31 last. The case may be summed up as follows: At a meeting of the Town Commissioners on Sept. 15, 1893, it was decided that the public lighting of the town

should be put up for contract. The Killarney Electric Light Company and the Gas Company accordingly sent in tenders; and at a subsequent meeting of the Commissioners, the tender of the latter was accepted for a term of three years, while the tender of the Electric Light Company was at the same time rejected owing to some alleged informalities. When the Municipal elections took place in October, 1893, "Gas *versus* Electric Light" was made the "platform" on which the four vacancies then occurring on the Commission were contested. Nominees representing both illuminants were put forward, with the result that the four supporters of electricity were elected; and on Nov. 6, the resolution accepting the Gas Company's tender was rescinded. At a subsequent meeting on Feb. 16, 1894, the Electric Light Company were requested by a resolution of the Town Commissioners to send in a tender for the lighting of the town. They accordingly submitted a tender on Feb. 17; and on March 7 following, the Town Commissioners sealed a contract with the Company, giving to them the public lighting of Killarney for a term of twelve months for the inclusive sum of £92 10s. The Electric Light Company thereupon took proceedings against the Commissioners for two quarters' payment for lighting the town—viz., £19 17s. and £17 10s.; and at the Quarter Sessions in January this year, the case came on for hearing. Judge Shaw then held that the electric light contract was good, and gave a decree for the amounts named. The Gas Company now claimed, as stated above, a half-year's payment for lighting. Mr. M. Healy, Town Clerk, and Mr. M. J. Santry, the Manager of the Gas Company, were the only witnesses examined. They gave evidence as to the contract and bonds entered into; and the rest of the proceedings was confined to legal arguments for plaintiffs and defendants. His Honour, in giving his judgment, said the Gas Company received no official intimation from the Commissioners that their contract was rescinded; and this being so, he should give a decree for the amount claimed.

Improvements in the Oswestry Water Supply.—Colonel Durnford, one of the Inspectors of the Local Government Board, has held an inquiry at Oswestry relative to an application by the Corporation for sanction to borrow £2100 for a period of thirty years, to pay the cost of relaying the water-supply pipes. Some of the present pipes have been down for 28 years; and samples which were produced by the Borough Surveyor (Mr. Wynne Roberts) showed considerable accumulated corrosion, which prevented a proper supply of water reaching the consumers.

West Gloucestershire Water Company.—The half-yearly meeting of this Company was held on the 30th ult. The report submitted by the Directors stated that, during the six months ending March 2 last, 114 additional services had been laid on; making the number of houses and other properties supplied at that rate 5313, which, together with some meter and miscellaneous supplies, were estimated to produce a water-rental of £4192 per annum. Adding about £50 for rent of property belonging to the Company, made £4242, which was an increase of £113 during the past six months. The accounts for the half year showed that, after paying all working expenses and interest on debenture stock, there was a net profit of £701, which, together with the £259 brought forward, made a total of £960. From this the Directors recommended the declaration of a dividend, less income-tax, at the rate of 2 per cent. per annum. This would absorb £692; leaving £268 to be carried forward. In the course of his remarks in moving the adoption of the report, the Chairman (Mr. Enoch Horton) mentioned that during the half year the mains had been further extended at a cost of £1000; but there were still important districts into which they desired to extend the mains as early as practicable. The motion was unanimously carried.

The Charges of the Portsmouth Water Company.—A deputation of the Improvement Committee of the Portsmouth Corporation had an interview towards the close of last year with the Directors of the local Water Company with reference to the charges for water in the borough. This is the second interview they have had within about twelve months on the same subject; and notwithstanding the very full reply which the Secretary of the Company (Mr. R. W. Ford) gave them on the first occasion, he has again taken considerable trouble in replying in writing to the various questions raised by them. The Improvement Committee do not appear to have much ground for complaint, as a mass of statistics which was collected by the Directors last spring shows the remarkable result that the charges for water at Portsmouth are the lowest for domestic supply of any water-works in England belonging to a Company. The charges for water-closets, for horses and carriages, for baths, and for watering gardens, are dealt with by Mr. Ford. The Company, it appears, only make the small extra charge of 9d. per quarter when there is more than one water-closet in the house; and this covers any number of closets beyond the first. As to horses and carriages, no charge is made if they are kept for private use only, and not for trade or business purposes. The charge for baths is only 3s. a year; and with regard to watering gardens, the Directors have allowed occupiers to use any quantity of water without extra charge, provided a hose is not used. The letter also reminds the Improvement Committee that the Directors have from time to time reduced their charges under various heads and until further notice, to the extent of about £2000 a year below those authorized by Act of Parliament, and that a number of philanthropic institutions are also supplied either at rates below those authorized, or entirely free of charge. At the interview, some suggestion was made as to the contamination of the water during or after very exceptionally heavy rainfall. Since then the Directors had retained Professor Wanklyn, in conjunction with the Company's Consulting Engineers (Messrs. Joseph Quick and Son); and reports from these gentlemen are subjoined to Mr. Ford's letter. They show that the supply is eminently satisfactory; and the Directors consider that any chemical treatment of the water would be prejudicial and unacceptable to the great majority of the consumers, and that they would not be justified in departing from Professor Wanklyn's advice, that, "in the interest of the community, this excellent water should be supplied in its natural condition," confirmed as those opinions are by such authorities as Dr. Medlock, Dr. Tidy, Dr. Hassell, and others.

MISCELLANEOUS NEWS.

GERMAN CONTINENTAL GAS COMPANY.

The Report and Accounts for 1894.

We have received, as in former years, a copy of the report of the directorate and of the accounts of the above Company, of which Herr W. von Oechelhaeuser is the General Manager. From it we extract the following particulars:—

The depression in trade continued in Germany during the past year; and the satisfactory financial position of the Company is due to the better conditions obtaining in the towns situated elsewhere which are supplied by it. The gas production in the German towns only rose by 2·4 per cent.; while in Warsaw and Lemberg the increase was about 5 per cent. The influence of bad trade was aggravated by the spread of incandescent lighting and of Sunday rest; and the effect of the South European time-reckoning recently introduced in Germany was also evident, as in the preceding year. The incandescent burners in use rose from 16,861 in 1893 to 30,446 at the close of 1894. The diminished consumption of gas due thereto was compensated by the augmentation to the extent of 5·15 per cent. in the total number of burners supplied. This is a larger increase than has been experienced in any year except the two immediately preceding ones. An advance was made by the introduction of benzol as an enriching agent at the Dessau, Potsdam, Erfurt, and Gladbach works, in consequence of experiments with petroleum products having proved unsatisfactory from an economical standpoint under the German conditions. In the current year carburetting with benzol will be introduced in the remaining works, as it not only enables the statutory illuminating power in the various towns to be attained with certainty, but gives the management greater latitude in the choice of coal. At the present time, it is impossible to foresee if acetylene produced from calcium carbide will find practical application on the large scale; but a small nterest has been secured in the Company recently formed in Berlin for the production of the carbide. On the 17th of November last, there was opened in Dessau the first tramway exclusively worked by gas-motor cars, under the direction of the Dessau Tramway Company, to the capital of which the Gas Company contributed about £2500. The results have so far been most satisfactory, though the least favourable period of the year was chosen for opening; and the tramway bids fair to increase the consumption of gas for heating and the supply of power in Dessau by about 50 per cent. in the course of a year's working. The promising outlook thus presented has led to the formation of a Company, having its head-quarters at Dessau, to acquire all the patent rights of the inventor, Herr Lührig, of the Deutz Gas-Engine Works, and of the Gas Traction Company of London, and to undertake the manufacture of gas-motor cars, gas locomotives, &c. The capital is £67,000, of which the German Continental Gas Company hold nearly £10,000.

There was an increase of 4·21 per cent. in the quantity of gas made by the Company, as compared with that of the preceding year—Warsaw being the chief contributor thereto. Lemberg, indeed, shows the largest percentage increase; but its total production is comparatively small. At Frankfort-on-the-Oder, Hagen, and Gotha only is there a falling off in the production. There is an advance in the quantity consumed for all purposes except for the lighting of factories, where it is stationary. The greatest advance has taken place in the consumption for cooking, heating, and motors; but even now the quantity so used is only 15·46 per cent. of the total production. There is a marked diminution in the amount lost by leakage, which is now 4·41 per cent. of the make. The length of mains laid has slightly increased. The price paid for coal averaged about 19s. per ton, which is about 3d. per ton less than in 1893. The make of gas was 10,754 cubic feet per ton; and the weight of coke and tar used for retort-firing amounted to 16·17 per cent. of the coal carbonized. The price of coke remained nearly the same as in 1893; but that of tar fell. Ammonia, however, fetched better prices. The total gas production of the Company was 39,809,008 cubic metres (1,405,918,000 cubic feet).

The accounts show a gross profit of 2,904,881·90 marks (about £143,000) for the past year—an advance of 360,752·29 marks on that of 1893. The net profit is 2,273,417·23 marks, of which the reserve and contingency funds take 638,151·59 marks. The remainder serves to pay the customary dividend of 10 per cent., and leave a small balance to be carried forward to the next account.

THE NEWARK GAS COMPANY'S PROVISIONAL ORDER.

Major Marindin's Report to the Board of Trade.

It will be in the recollection of our readers that, early last month (see *ante*, p. 549), Major Marindin, R.E., C.M.G., on behalf of the Board of Trade, held a local inquiry in regard to the application of the Newark Gas Company for a Provisional Order giving them power to alter and extend their works, and to raise the necessary capital. The following report has been received by the Board of Trade from the Inspector, and by them transmitted to the parties interested in the application for the Order:—

In this case, the somewhat unusual feature presents itself that it is generally admitted that the Company have been supplying a good article at a cheap rate, and has been thoroughly well managed; the only objection taken to their past proceedings being in regard to certain undue accumulations of profits, which there can be no doubt they were not justified in making. The necessity of additional storage and other works was not disputed.

The Corporation of Newark made a general objection to the granting of the Order, on the grounds that they wish to have in their own hands the power to light the borough, and are prepared to purchase the undertaking on fair terms; and they also raise objections to the clauses as to the extension of the limits of supply, the capitalization of certain undivided profits, the amount of capital, the power to sell gas in bulk,

the illuminating power, the proposed standard price, the place of and the provisions as to testing, the power to exact prepayment, and the power to supply electricity.

Leaving for the moment the general objection, the concessions made dispose of some of the above objections. 1. The capitalization of £2800 of undivided profits was given up, and clause 9 was struck out. 2. It was agreed that the additional capital of the Company should be £10,000, with powers to borrow £2500—£7500 being also raised on the existing works if required; and that, in addition, £4000 of the accumulated profits should be carried into the capital account, to bear no dividend. Clause 10 to be altered accordingly. 3. The location of the testing-place at the works was agreed to; and it was also agreed that no notice should be required for the testing for pressure, and only half an hour for the testing of the purity and illuminating power. Clauses 36 and 37 to be amended accordingly. 4. The power to supply electricity was not asked for; and clause 46 was struck out.

The Corporation did not press the objection as to the extension of the limits of supply; and it was agreed to leave to the Board of Trade to settle (on the usual lines) the questions of supplying in bulk, and exacting prepayment. But as regards the latter question, it was considered that if allowed at all three months should be the limit.

The objections of the County Council, and the other dissenting Authorities outside the borough, were met by the Company accepting a suggestion made by Mr. Earp, to the effect that it should be laid down in the Order that the Company should not exercise their powers in any of the parishes in which consent has been withheld, unless they were invited to do so by the Local Authority. The price in the country to be 6d. above that in the borough. A clause in this sense should be inserted, and should, I think, be made to refer to all parishes alike.

The objections of Mr. Nicholson were met by an agreement between himself and the Company in the following terms: 1. That the Company shall not use the land purchased from Mr. Lamb for the manufacture or purification of gas, or any residual products, or for the storage of any offensive products. This condition to be embodied in a clause. 2. That the Company shall close the grids of the liquor or tar tanks, make the man-lids air-tight, and put in a ventilating-pipe. 3. That the Company shall make arrangements to ventilate the lime purifiers when they are altered and enlarged, by using an exhauster to blow air through them before changing, and thus deodorizing the spent purifying material before exposing it to the air.

The objections of Mr. Cooper were maintained; and the Company declined to be bound either to purchase his land or to compensate him as he demanded. The questions remaining for consideration are therefore: 1. The general objection of the Corporation, who ask that a clause may be inserted giving them power to purchase compulsorily at any time within two years of the passing of the Order. 2. The price to be fixed as the standard price. 3. The illuminating power. 4. The power to sell in bulk and to exact prepayment. 5. The case of Mr. Cooper's land.

After carefully considering all the evidence and arguments put before me, I am of opinion—

1. That, inasmuch as there is no precedent for the insertion of a clause for the compulsory purchase, except by agreement beforehand, in any Gas Bill or Provisional Order, no such clause should be inserted in this Order.

2. That the standard price asked for by the Company—viz., 3s. 3d.—is too high, having regard to the facts that they have been able to pay their maximum dividend, and to keep their reserve fund full, and even to accumulate profits, when selling at 2s. 9d. At the same time, while attaching due weight to the argument that, if they continue to manufacture at the same cost, the raising of the standard above the price now charged would enable them to at once raise their dividends, I think that some allowance should be made for the large additional expenditure they are about to incur, and for possible loss owing to increased price of coal, coal strikes, competition with electric lighting, &c. The Company during 1893 and 1894 (which were, no doubt, abnormal years) were not earning the full dividend, although the full dividend was paid; and it appears that the bulk of the accumulations they have collected was made at a time when the price varied from 4s. 3d. to 2s. 11d., and that since 1889, when the price was reduced to 2s. 9d., the aggregate amount accumulated is only about £400. I think, therefore, that it would be fair to allow a standard price of 2s. 11d., which is, compared with that usually allowed, a low standard, and one to which no objection would have been taken, if the Company, instead of being an exceedingly well managed one, had, owing to bad management, and consequent higher expenses in production, been obliged to charge a higher price than the low price now charged. It was agreed that the price in the country districts should never be more than 6d. in excess of that charged in the borough; and this should be clearly laid down.

3. That the usual clause as to illuminating power should be adhered to; and that this should be fixed at 15 candles.

4. That the questions of supplying in bulk and exacting prepayment should be dealt with on the usual lines.

5. That, although in my opinion it was not right for the Company to schedule Mr. Cooper's land when evidently they had no intention of buying it, and apparently solely with the object of keeping down the price to be paid for Mr. Lamb's land, I do not think that any sufficient reason has been advanced to justify the course of stipulating that, unless Mr. Cooper be compensated, the Order, which will clearly be for the benefit of the public consuming gas in Newark, shall be thrown out. No doubt the erection of a gasholder on the ground alongside Mr. Cooper's land will depreciate the value of that land for building purposes. But the right of the Company to erect high warehouses or other buildings on this land is not contested; and such erections would have the same effect, although in a less degree. The gasholder should, however, be restricted in height, in accordance with the Company's consent to limit it to two lifts.

Subject, therefore, to the necessary alterations being made in the clauses of the Order to meet the points detailed above, I recommend that the Order shall be granted, and that the consents of those authorities who may still withhold them shall be dispensed with.

(Signed) F. A. Marindin, Major, R.E.

LLANBERIS GAS AND WATER SUPPLY.

Board of Trade Inquiry.

On Friday, the 22nd ult., Lieut.-Col. Yorke, R.E., opened an inquiry at the Dolbadarn Hotel, Llanberis, in regard to an application made to the Board of Trade by the Llanberis Water and Gas Company for a Provisional Order to enable them to maintain and continue their existing works, construct additional works, and supply gas and water in the parish of Llanberis.

Mr. J. Bryn Roberts, M.P., appeared for the Company; Mr. J. H. Bodvel-Roberts, the Clerk of the Carnarvon County Council, watched the proceedings on behalf of that body; Mr. D. P. Williams, Mr. Lloyd Williams, and Mr. Cross represented the Gwyrfai District Council; and Mr. Jackson opposed the application for Mr. Assheton Smith, the principal landowner interested in the scheme.

Mr. Bryn Roberts, in opening the case, said the water-works were constructed 20 years ago; and since then the village of Llanberis had been supplied with water without any complaint whatever. Prior to that time, there had been only a very insufficient supply, furnished by means of tanks made by one of the gentlemen who now opposed the Order. The gas-works were erected 25 years ago. The Company had a lease from Mr. Assheton Smith under certain conditions; and with these they did not intend to interfere. All they required was to place the works on a legal basis before incurring any further expense. The opposition stated that the works should be in the hands of a public authority, and that the rates proposed to be charged were excessive. As to the first point, the applicants at once intimated that they were willing to transfer the works; and this was provided for in the Order. If it was more advantageous for the public to have the works, they could have them at their present value. As to the second objection, the applicants stated that at least their charges did not exceed those of any other water undertaking in the county. If the Board of Trade considered the rates were too high, the applicants were prepared to take any others considered fair and right. But the rates asked for in the Order were a slight increase on the present charges.

Mr. *R. Lloyd Jones*, the Engineer of the works and the Borough Surveyor of Carnarvon, said the water-works were first constructed by Mr. Owen Ellis Owen in 1875-76. The reservoir was 42 feet long, 14 feet wide, and 6 feet deep, and it was placed 255 feet above the level of the main road, which was 345 feet above Ordnance datum. The supply was good to the highest houses in the district. The water in the reservoir, before it passed into the mains, was screened with perforated copper gauze and fine galvanized wire netting. The mains were of 4-inch cast iron, tested to 400 feet head of water, and coated with Dr. Angus Smith's solution. They were first-class pipes. The 3-inch and 2-inch mains were the same. He visited the works during their progress, and the pipes were properly laid. The pressure was ample; but it was not good at the present time on account of the leakages caused by the recent frost.

In answer to Mr. Bodvel-Roberts, witness said there were eight or ten hydrants—eight in the main street. By extending the intake higher up, they would lose about half of the gathering-ground; but they would still be in a position to supply the whole of Llanberis. Assuming that water were required for flushing the drains, 1s. 6d. per 1000 gallons would be a reasonable charge. He believed there must have been a mistake in inserting 2s. 6d. in the Order.

Mr. *T. B. Farrington*, of Conway, said he had made a survey of the works, and considered they were suitable for the present requirements of Llanberis.

Dr. *Owen* said he had resided in Llanberis about eleven years, and during that time they had no complaint to make as to the water supply. For the last five years it was quite sufficient; but it might have been otherwise in the earlier years. The quality was good and soft.

Several other witnesses having spoken as to the quality and adequacy of the supply,

The Hon. *W. E. Sackville West*, the Chairman of the Carnarvonshire County Council, said his general view was that water-works should be in the hands of local authorities. He supported the opposition to the scheme on behalf of the Council. As far as he knew, there was no security against the maximum rates being charged by private owners; while if the works were in the hands of the Local Authority, he supposed that any profit made would go to the ratepayers. He was opposed to arbitration in deciding the matter of purchase, if it could possibly be avoided, inasmuch as it involved much unnecessary expense.

Mr. *T. T. Marks*, of Llandudno, having suggested several alterations in the existing works, said it would be better to have them in the hands of the Local Authority. In his opinion, the transfer should be by open sale, not by arbitration, as this would be very expensive.

Mr. *D. Wilson Roberts* said he had been collecting the water-rents for 15 years. The works were sold in 1859 for £1500. If the Order were granted, it would mean an increase of many pounds in the price of water. He believed his brother obtained £900 for the works. Witness had heard many complaints with regard to the water.

Alderman *D. P. Williams* said he was acquainted with the water-works when they were in the possession of Mr. Roberts. The water-rate was then 1½d. a week for cottages and 1s. in the pound on the rateable value of houses over £8, as the rateable value then existed. He believed the rate charged by the old Company fairly recouped them for the expense of maintaining the works; and he saw no reason why private owners could not exercise their full rating power under the Order, if granted. There had been scarcity of water at his own house, especially in summer. He had also heard a great number of complaints from other parts of the town. A number of public meetings had been held, at which a feeling was very strongly expressed against the Order; but he chiefly objected to it on financial and sanitary grounds. He would be willing to use his own influence to have a fair price paid for the works; but he would strongly advise the parish not to embark on arbitration. He thought that the Council would be willing to purchase, provided the terms were reasonable.

At this stage the inquiry was adjourned.

On the next morning, attempts were made to arrive at a settlement,

by which the Local Authority could purchase the works; but as these proved of no avail, the inquiry was continued. A witness was called who expressed an opinion that the works should, like all other public works, be in the hands of the Local Authority. He said they were offered to him some twelve months ago for £1000 or £1200. Evidence was next given to the effect that the water supply was not sufficient, and that the feeling in the village was against the granting of the Order.

Mr. Bryn Roberts then briefly reviewed the evidence, and the inquiry closed.

WITHDRAWAL OF THE DUBLIN CORPORATION BILL.

At the Meeting of the Dublin Municipal Council yesterday week, the Town Clerk informed the members that, at the meeting of the Committee of the whole house on March 27, he was directed to report to the Council that the Committee recommended the withdrawal of the Dublin Corporation Bill, 1895. In moving a resolution withdrawing the Bill, the Lord Mayor said the Committee of the whole house had considered the matter, and did not feel justified in proceeding, under the circumstances, with the Bill. His Lordship then reviewed the circumstances connected with the promotion of the Bill; and, continuing, he said that its withdrawal had resulted in the shares of the Gas Company going up, he thought, £2; and if the Kingstown Township had been a limited liability company, he supposed its shares would have gone up another £2. The Gas Company rejoiced that a reasonable effort made to bring them into proper relations with the city had for the present failed. He could well sympathize with the shareholders of the Gas Company; and he could quite recognize the right of the Chairman of the Company to rejoice at the Bill being thrown out. It was perfectly reasonable that he should do so; and he did not find fault with the observations which he made on the occasion on which he rejoiced over the Bill. The Kingstown Commissioners, too, had had a jubilation meeting on the subject; and a resolution of thanks was moved to the Chairman. Moved for what? Because the Chairman of the Kingstown Commissioners, fearing to face a Committee of either House of Parliament, by a side wind stopped the progress of the Bill; and for the present Kingstown continued to take water from Dublin, for which it did not pay a penny. He did not understand such action by gentlemen like the Kingstown Commissioners, who, he believed, would not in their private capacity act as they as a corporate body had done. He thought that, if it was a transaction in which any member of that body was engaged, he would not continue to defraud the Corporation of the money which the Kingstown and other Commissioners were continuing to do year after year. But perhaps they considered they were justified in protecting what they called the interests of their constituents. He trusted the Corporation would not abandon one line or clause of the Bill, but would press it forward next year with the almost unanimous voice of the citizens of Dublin. Mr. Hutchinson seconded the motion, which, after a long discussion, was carried.

THE MIDDLESBROUGH GAS COMMITTEE AND WATER GAS.

A Report by Mr. David Terrace.

At the request of the Middlesbrough Corporation Gas Committee, the Engineer of the gas-works (Mr. David Terrace) has submitted the following report on the manufacture of carburetted water gas: "The cost of plant for the manufacture of 24-candle power gas, of a daily capacity of 700,000 to 1,000,000 cubic feet, would be from £6000 to £7800; and the cost of manufacture about 1s. 2d. per 1000 cubic feet into holders; being at the rate of 0·58d. per candle per 1000 feet, as against 1s. 2d. for our coal gas into the holders, or 0·88d. per candle per 1000 feet. (During February, the gas produced had an illuminating power of 15·40 candles; and during March, 16·20 candles.) If one-fourth of the gas made were carburetted water gas, we would be able to supply, with no extra cost, a quality of 17-candle power. The advantages may be summed up as follows: (1) The space required is only about one-third of that occupied by ordinary plant. Thus, instead of the suggested extension only serving three years with ordinary retorts, it would serve for nine years' increase. (2) For the same production, the cost of erection is one-third that of inclined retorts. (3) Cost of working: 1000 cubic feet of gas of 24-candle power can be manufactured as cheaply as 1000 feet of 16-candle coal gas; or, otherwise, 1500 cubic feet of carburetted water gas could be made for about the same price as 1000 feet of 16-candle coal gas. (4) Full command of keeping to a 16-candle standard; whereas, in ordinary working with Durham coal, it is scarcely possible to keep to a full 16-candle power. (5) Instead of shipping coke (when not in local demand), it would be used for the production of the carburetted water gas—1785 tons of coke being sufficient fuel for making 100 million cubic feet—about one-fourth of the annual make; 2000 tons of oil being required for this quantity. The only disadvantage appears to be in the greater quantity of carbonic oxide there would be present in the gas sent out. Usually this is about 5 to 6 per cent.; but it would be increased to 10 or 11 per cent. This is not so detrimental in the use of the gas; but in the case of an escape in a confined place, asphyxiation and poisoning would supervene more quickly than with the ordinary coal gas. This, however, in practice is found not to be such a factor as to impede the introduction of carburetted water gas in towns." The Committee have ordered the report to be entered on the minutes, and have requested Mr. Terrace to consider the question of enriching the quality of the coal gas supply.

OLDBURY GAS SUPPLY.

The Working during the Past Year.

At the Meeting of the Oldbury District Council on the 5th inst., the Gas Committee reported that they had approved and adopted the statement of accounts presented by the Manager (Mr. A. Cooke) for the year ending Dec. 31, 1894. They expressed their desire to place upon record their hearty appreciation of the industry and care displayed by Mr. Cooke in the management of the business, and also for the very satisfactory balance-sheet he had produced. They recommended that, out of the balance of net profit, £400 be paid over to the district fund account, in consideration of the loan of £1055 paid off in May last, upon which no interest had been charged. They reported that they had had submitted to them plans for altering the carbonizing plant so as to produce gas on the regenerative system; and they recommended the Council to obtain tenders for the supply of retort-settings at an estimated cost of £2000. The Chairman of the Committee (Mr. J. W. Wilson), in moving the adoption of the report, congratulated the Council upon the very successful result of the working of the gas undertaking in the past year. He pointed out that the net profit was about £1900, which was greatly in excess of anything that had previously been achieved. The profit for 1893 reached £900. During the year there had only been a slight increase in the sales of gas; but the Committee had been enabled to manufacture cheaper, and had saved £550 on their coal. By economizing they had made a profit of £273 on the residuals; while at the same time they had been enabled to sell £140 worth more gas. As a business undertaking, calculated upon a total capital of £79,000, and a gross profit of £5793, a dividend of 7 per cent. could be declared. He warned the Council that the Committee had no reserve or depreciation fund; but they had repaid £8000 which had been borrowed as working capital. While they had been clearing off this sum, they had found it impossible to commence a reserve fund. He hoped the £400 which was to be turned over to the Council would not be included in the estimates, but would be kept for any necessity that might arise. He estimated that the profit at the gas-works this year would only amount to £800 or £900. After some discussion, the report was adopted.

ELECTRIC LIGHTING NOTES.

A resolution was moved by Alderman Brook, at the last meeting of the Halifax Town Council, to the effect that application be made to borrow £5000 to complete the original scheme of electric lighting, and £5000 for additional plant and extensions. He explained that more land had been found necessary than was at first contemplated; and the works were extended. They had built premises large enough for future extensions; and in this respect the provision, it was believed, would be sufficient for 25 or 30 years. The demand for the electric light was advancing; and the plant would before long have to be increased. The motion was adopted.

A leader writer in the *Cambrian* views with considerable misgiving the proposal of the County Borough Council to proceed with their electric lighting scheme. There can be no question, he says, that Swansea is a badly-lighted town; but whether it is wise or even politic to spend so large a sum as £32,000 in employing electricity as an illuminant, is a matter which is open to considerable doubt. The figures quoted form the estimate of Mr. Manville, the expert whom the Corporation have engaged to advise them; but the writer ventures to assert that they do not by any means represent the total cost involved in bringing the scheme to a successful issue. The rates are oppressively heavy; and the ratepayers will follow with a watchful eye the progress of the work, in order to ascertain what extras are incurred, and the reasons which render them necessary. The advent of the electric light into Cardiff has been the reverse of successful; and what guarantee has Swansea that their experience of it will be more satisfactory?

In answer to a circular sent out to consumers by the Gas Committee of the Middlesbrough Town Council, asking whether they would be prepared to use the electric light in the event of the Corporation supplying it, 801 have replied in the affirmative, 3192 in the negative, and 2181 did not return the circulars. Those answering in the affirmative (being mainly resident, or carrying on business, in the principal thoroughfares) estimated their total requirements at 10,000 lights. It has been decided to defer the question.

Among the minutes submitted by the Gas and Electricity Committee at the meeting of the Bradford Town Council last Tuesday, was one stating that a tender of Messrs. Siemens Bros. and Co. for supplying two 300-horse power engines, each coupled with a Siemens dynamo, had been accepted, at £3980. There were 22 tenders submitted for this machinery; the highest being £5900.

An important recommendation from the Electrical Committee came before the Bristol Town Council last Tuesday. It was that they should be granted permission to borrow an additional £10,000, of which £8000 is required for extending the distribution system, and £2000 for connecting "anticipated" new customers in streets in which mains are already provided. The capital embarked in the undertaking amounts to £90,000, consisting of £66,000, the borrowing of which was authorized on March 10, 1891, for establishing the installation, and of £24,000, the borrowing of which was authorized on Dec. 12, 1893, partly for paying off liabilities incurred in excess of the sum of £66,000, and partly for extensions of the system for private supply. By means of this expenditure, machinery and plant have been provided capable of serving 34,000 lamps. The number of lamps now supplied is 17,425; being only one-half the capacity of the plant. The Committee therefore consider that, in order that the undertaking may become a source of profit, every effort should be made to bring the output of electricity up to the full capacity of the plant. They also consider that it is important to obtain as customers the residents in private houses where artificial light is used during longer hours than in the case of shops. In moving the adoption of the Committee's recommendation last Tuesday, Mr. Pearson made a statement, which will not form at all pleasant reading for the ratepayers. He said that, at a cost of £3000, the plant could be made equal to 40,000 lamps; and this was sufficient to show they were not working at an economical rate, and therefore they had to apply for a rate in aid of the undertaking. The position during the past year—the first whole year of their experience—was that in March, 1894, the Committee asked for £4750, and in September, 1894, £3250—a total claim of £8000 on the rates. In return, the city had been supplied with electricity for street lighting at a cost of £2837. This left £5163 contributed by the rates in aid of the installation. Then they had expended £579 in cleansing and supplying carbons for the street-lamps, &c.; and repaid £3760 off principal. Therefore, the figures worked out at a net loss to the city of £824. The recommendation was adopted.

A GAS MANAGER'S VIEWS ON PUBLIC v. PRIVATE TRADING.

At the last Meeting for the winter session of the Saltcoats Literary and Debating Society, Mr. J. NAPIER MYERS, the Engineer and Manager of the Saltcoats Gas Company read an interesting paper on "Public *v.* Private Trading."

The author began by remarking that the old exhortation not to take thought of our food, drink, or clothing was wholly discarded in the speeches and writings of the political and reasoning school known as the Manchester Economists, as well as in the orations and essays of the plausible and romancing advocates of Socialism, inasmuch as the first article of belief of the former is to "buy in the cheapest and sell in the dearest markets, and thereby maintain a trading warfare against the world, as the great underseller of other nations," while the gospel of the latter is the equal distribution of existing wealth. He then went on to say that those who reflected on the contentions of both schools, would see that they preach widely different sermons from that contained in another exhortation, addressed to the Corinthians, to "let no man seek his own, but every man another's wealth." This text, he said, seemed to him to summarize the entire creed of the two schools of economists; for instead of no thought being given to procuring the necessities of life, the whole trend of present-day literature and legislation was to drive home to the masses that their individual thoughts and energies should be devoted to increasing their worldly comforts—the Individualists maintaining that this would be best accomplished by individual effort; while the Collectivists said the maximum of happiness could only be obtained by municipalizing and nationalizing everything.

Passing to the subject of his paper, Mr. Myers explained that he purposed recounting briefly a few thoughts on the question of "Private *versus* Public Trading," which had been generated in his mind in the course of reading and studying the general and technical literature issued in connection with light, water, and sanitary engineering; and he asked his audience to remember that these three branches of industry had, so far, been the principal—indeed, almost the only—instances of municipal management. He then proceeded as follows: Now, the first and most pertinent question is, Has the municipalization of light, water, and sanitation led to better management, or proved an advantage to the communities interested? In other words, are the results such that we can say collective or public supervision has been better than individual or private enterprise? I am aware that the great majority of the members of all political parties are at present in favour of the idea that light, water, and sanitary affairs ought to be in the hands of municipal or local authorities. They will not be satisfied to see corporations undertake the supply of light and water only. Municipalities must go far beyond such undertakings, and enter into competition with rivals small and great. We see evidence of this spirit in every issue of our local papers. The desire of local busybodies or small politicians to set up business in gas, water, or electrical schemes is not founded on anything deeper than sentiment, or sometimes of "pure cussedness."

Dealing further with the question, Mr. Myers said: The history of gas and water undertakings which have been acquired by local authorities or town councils does not support or strengthen the case of those who maintain that gas or water can be supplied cheaper or more efficiently by public than by private enterprise. The cheapest gas in the kingdom is made farthest from the coal-fields by a private Company; and I am disposed to think that had the business of the Plymouth Gas Company been acquired by the Corporation twenty years ago, instead of selling gas, as they now do, for 1s. 9d., it would have been 2s. 9d. per 1000 feet, and the consumers would have been indirectly taxed to provide pavilions for Punch and Judy shows. Those of you who take an interest in parliamentary procedure know that the sole reason admitted by our Parliament as justifying the transfer of gas or water undertakings from private companies to town councils is that of expediency. Expediency, I maintain, should be confined to the power of proving that the transfer from a private company to the local authorities ought to result in the public obtaining cheaper light or water. That is the only factor which should enter into the problem. The interest of a town council in acquiring control of the gas or water consists, or ought to consist, in the prospect of securing cheaper public lighting, or of improving the gas or water supply of the town. Now, the words "it is expedient," in every Parliamentary Bill, rarely convey the true or actual motive for local public bodies acquiring gas or water undertakings, as the gas-works are generally run by municipal bodies to make them "milch cows" to contribute to the general municipal funds. That is the true motive for the anxiety of municipal and local authorities to get possession of gas and water undertakings. There are some good reasons to be advanced for the municipalizing of light and water companies—*e.g.*, these are wholly local industries, export nothing, live upon the local community, can only prosecute their business by making constant use of the streets, and abuse of the roadways. I see few objections why, in the interest of health and cleanliness, the management of water and sewers should not be in the hands of the municipalities; "but when a municipality steps outside the straight path of parochial utility, and by a majority (maybe of one) involves the credit, not only of all its constituents then existing, but of many future thousands, in purely commercial and largely speculative ventures, such as gas vending or electricity vending, 'a magnificent sample of municipal enterprise' may very well become a piece of injustice." Though gas vending may have, and has, helped the rates in many towns, it has always been an indirect taxation upon the consumers of gas. As good a reason may exist for the municipalizing of bread and milk, or even whisky.

Considering next the subject of the unification of industry under State control, where all men would be reduced to a common level, Mr. Myers said this was an idea which found lodgment in minds of a poetic and theorizing order; and one would not quarrel very vehemently with them in their advocacy of an equal distribution of wealth, if these "champions of spoilation" were men who had, by their own individual energy and capacity, created any proportionate share of the world's wealth. But the heroes of the doctrine that no man should seek his own, but another's wealth, were generally shallow visionaries. The teaching of the Collectivist appeared to him (Mr. Myers) to destroy or supplant the stimulus to courageous enterprise and tireless energy. The socialistic controllers of municipal ventures owed what little success had attended their efforts to the capable men trained by private companies; but the way in which they haggled over the remuneration of their "captains of industry" did not attract capable men to the service of the community.

In conclusion, Mr. Myers said that, in thinking over the *pros* and *cons* of Collectivism and Individualism, it had come home to him that Carlyle's idea of history was to be preferred to that of Macaulay. The Ecclefechan seer preached that this is a world in which little can be known, and very much has to be done. Carlyle was a strong reasoner; and his whole teaching was that a man deserved nothing, and that the rights of man were nothing compared to his duties. The Collectivist School, on the other hand, prated about the rights of man, and conveniently left his duties out of their vapourings. The rights of man were, according to their "Gospel of Labour," the right to take a share of rewards and earnings of those who gained wealth while they "biggit castles in the air." He thought they could all do something to save Individualism from cast-iron, barbaric heathenism, and unite it to the Collectivist doctrine to "look not every man on his own things, but every man also on the things of others." They could do unto others as they would have others do unto them; and whatsoever their hands found to do, they could do with all their might. He knew of no other panacea to correct the evils now to be seen around us.

THE LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

The Proposed Acquisition of the Undertakings.

At the Meeting of the London County Council last Tuesday—Mr. A. ARNOLD in the chair—the question of the proposed acquisition by the Council of the undertakings of the London Water Companies was again discussed.

The VICE-CHAIRMAN (Mr. J. Williams Benn, M.P.) moved the following resolution, of which he had given notice: "That, in the opinion of the Council, it is desirable that the Parliamentary Committee should press forward in Parliament the London County Council Bills for the purchase of the Lambeth and the Southwark and Vauxhall Water Companies with all possible speed." This motion, he said, was not confined to the two Bills named therein, but the question before the Council was really their whole policy with regard to the water supply of London. The policy of the last six years had its commencement in the Duke of Richmond's Commission 25 years ago. That policy was confirmed and elaborated by the Commission of Sir William Harcourt in 1880, and culminated in the report of Sir Matthew White Ridley's Commission. It was, therefore, not a party question. He quoted both Lord Salisbury and Mr. Chamberlain as being in favour of the municipalization of the water supply for London; and he gratefully recognized that on the side of his motion he had the old City of London, which had always been in favour of the consumers rather than the Water Companies. Three centuries ago, the City owned the water supply; but in an unfortunate moment they lost it, and had since been trying hard to recover that possession. The Council did not propose to take over all the Companies at once, as this would be somewhat unfair. They had to be considered on their merits; and the Council had selected the two Companies who paid the lowest dividends and made the highest charges. They had before them the results of the municipalization of the water supply in many provincial towns. These showed that Birmingham derived a profit of £26,000 a year from that source, notwithstanding the fact that the daily consumption had doubled. Similar satisfactory results were obtained in Glasgow, Manchester, Liverpool, Leeds, and many other places. Dealing with an amendment of which Sir John Lubbock had given notice, he quoted statements by Sir John in support of the Council having the control of the water supply. As a matter of fact, this was not a question of 1d. or so in the pound; it was a question of public health. Nor was it a party question; for, long after their little party differences were forgotten, posterity would honour the names of those who had taken the first steps to endow the Metropolis with the ownership and control of the first necessary of life.

Major PROBYN seconded the motion, because, in his capacity as a member of the Water Committee, he had, he said, learned a great deal which commended the course proposed by the Vice-Chairman. Assuming the cost of the acquisition of the water undertakings to be as stated by some—30 millions—if they took the debenture stock, the preference stock, and the common stock of the Water Companies, totalled them up, and divided them by three, it would come out at about 3¾ or 3½ per cent. Allowing for the extra cost and working which might possibly occur, they would have a surplus of quite ½ per cent. on 30 millions of money, which would go to the advantage of the ratepayers. He hoped the Council would endorse the action of their predecessors, and push on with the Bills named in the motion.

Sir J. LUBBOCK proposed as an amendment—"That the Finance Committee be instructed to report to the Council as to the probable effect upon the rate of the purchase of the Water Companies in the manner proposed in the Bills now before Parliament, having regard to the resolution of the Council with reference to the necessity for an additional source of supply, and on the basis of repayment in the maximum period of 60 years." He pointed out that, when in 1891 some of the Vestries proposed the formation of a Water Trust, the Parliamentary Committee of the Council, in a report signed by Mr. C. Harrison, resisted the proposal on the ground that it must lead to a large increase in the rates, because the Trust would have imposed on it the duty "not only of purchasing the works, but of supplying water from new and independent sources—a policy to which it can hardly be conceived that the inhabitants of London ought to stand committed. It is probably no exaggeration to affirm that this extraordinary scheme might cost London, if carried out as proposed by the Bill, some

indefinite sum approaching £50,000,000." Yet this was what Mr. Harrison himself was proposing. Again, in the same year, the Water Committee presented a report condemning the Bill, which was signed by Lord Farrer, and in which it was said: "It is no exaggeration to say that London might in this way be made to pay from 30 to 40 millions in purchasing the Companies, and might then find itself obliged to spend from 10 to 20 millions more in providing a new supply. This would, in all probability, be the result of an obligatory immediate purchase on arbitration terms; and such a purchase must, therefore, be resisted at all hazards." He could not put the objections to the course proposed by the late Council more strongly than these quotations from reports. Lord Farrer was, he believed, still of the same opinion. Mr. Harrison, no doubt, had changed; but his arguments were as strong as ever. He had suggested an alternative policy which, he believed, would be far cheaper for the ratepayers—viz., that steps should be taken to limit the supposed right to make up back dividends to six years, as suggested by the House of Commons. If this were done, and two or three Directors appointed to protect the public interest, they would, as the Companies were probably paying their maximum dividend, obtain the advantage without the expense or risk of purchase. He did not, however, ask the Council to adopt, or even to consider, any such plans at present. He was only anxious that they should obtain the materials necessary to enable them to form an opinion before committing themselves. The analogy of other municipalities did not hold good for London, because no other municipality had stood in so favourable a position. He did not wish, however, by his amendment, to commit the Council in any way on the subject of purchase; but he was anxious that they should proceed in a businesslike manner. If they were dealing with their own money, would they not ascertain approximately the cost before embarking on the purchase? They were asked to take a leap in the dark, to enter into the most gigantic speculation ever made; and he submitted that this should only be done after careful consideration of the fullest information they were able to obtain on the financial aspect of the subject. He agreed that this was no party question; and that was why he wished the Council to look at it as a purely business one.

Sir J. Dimsdale, in seconding the amendment, expressed not only surprise but amazement that any Bill should be permitted to go forward, with such immense interests involved, without the most moderate information which was asked for by Sir John Lubbock.

Mr. C. Harrison briefly reviewed the history of the discussions and inquiries on the water supply question from the report of the Duke of Richmond's Committee in 1869, the whole purport of which, he contended, was that the property of the Water Companies should be acquired either by the County Council as the municipal authority, or in conjunction with the Local Authorities of outside areas.

Mr. Whitmore, M.P., said the members who supported the amendment were anxious not to take a leap—or he might rather say a water ump—in the dark, without being told the depth, or the width, or where they were going to land, or in what direction they were going to travel when they did land. There was a vague public opinion afloat, grounded on the belief that there would be a profit to the ratepayers by the Council acquiring the water undertakings; but they must have an authoritative statement from the Finance Committee whether or not this opinion was justified.

Sir J. Hutton maintained that the matter had been fully considered by the Water and Finance Committees, and also by the Council.

Mr. Beachcroft said the ratepayers and the Council had come to the conclusion that the water question could only be settled in one way—in the House of Commons. The amendment did not involve the withdrawal of the Bills, but merely the furnishing of facts on which the Council should proceed with the Bills. The Moderate policy was not to throw out these Bills, but to save the ratepayers' money.

Mr. J. Stuart, M.P., said if they now stopped going on with the Bills till a later date, they would not be able to get them through this session. He pointed out that, at a cost of 34 millions, the Council could repay interest and sinking fund at about £1,900,000 per annum in 34 years. This was within a very little of the amount now divided among the shareholders and debenture holders of the various Companies, after all expenses had been paid. If they borrowed money for 100 years, they saved, on the repayment of the 34 millions, £150,000 a year, which was about 1¾d. in the pound on the whole of the present rateable value. There were eight Companies, with their respective head-quarters; and he held that there would be a considerable saving by concentrating the management in one. The arbitration proposed in the Bill was not to be an open one; and unless this was agreed to, he should consider it his duty to throw up the Bills.

Mr. Ritchie said he had not had an opportunity of seeing the Bills; the new members not having been furnished with them. He considered this was not a fair way of dealing with such important questions. Mr. Stuart had said that, if they did not push forward with these Bills, they would not be passed this session. The Council were constantly being asked to deal with things at high pressure. He urged his friends to neglect such statements. They had a duty to perform to the ratepayers, and they were entitled to time for doing it. The Moderates were not opposed to the Bills proceeding, provided evidence were produced that they were in the interest of the ratepayers. He could not but think that, if the Water Committee had approached the Water Companies in a fair and reasonable manner, they would have been able to obtain a price.

Mr. M'Kinnon Wood, the Chairman of the Parliamentary Committee, supported the motion, and referred to the unreality of the complaint as to the difficulty of obtaining information as to the nature of the Bills, which were, he said, in the library. As to supplying an exact figure, this was impossible on the accounts as now presented by the Water Companies. But even if they could have done so, it would not have been wise to give it out to the Council.

After a discussion which extended over three hours, a division was taken, with the following result: For the amendment, 49; against, 67—majority against, 18. On the motion being put as a substantive resolution, a show of hands gave a large majority in its favour. The result was received with loud cries of "Divide," met by counter-cries of "No;" and several Moderates left. Some, however, returned, and a division was taken, when the numbers were: For the motion, 66; against, 30—majority for, 36. The announcement of the numbers was received with loud cheers from the Progressives.

The Parliamentary Committee reported that they had prepared a Bill to authorize the Council to raise and expend money on capital account in connection with the acquisition of water-works from the London Water Companies, and had made provision in it for the redemption of stock raised, or repayment of any money borrowed or expended on capital account for the purposes of the Act, within a period not exceeding 100 years. In consequence of this provision, the Bill would have to be introduced as a Public Bill; but it would not be proceeded with in the event of the Transfer Bills not passing this session. The Council were asked to approve the Bill, and to authorize the Committee to take all necessary steps towards passing it into law. This was agreed to. It was also agreed that the City Corporation should have a representation on the future Water Committee to the extent of one-eighth of its total number, upon the basis and terms set forth in the London Water (No. 1) Bill of 1892, as deposited.

THE METROPOLITAN WATER COMPANIES AND THE FROST.

Local Government Board Inquiry.

The first of the inquiries which are to be held by Major-General A. de Courcy Scott, R.E., relative to complaints which have been addressed to the Local Government Board respecting the deficient supply of water in the Metropolis during and in the period succeeding the recent frost, was held last Tuesday, at the Offices of the Wandsworth District Board of Works. The proceedings were limited to one of the petitions from the district of the Lambeth Water-Works Company.

The Inspector opened the inquiry by reading the notice of his appointment, which was addressed to the several Water Companies and to "all others whom it may concern." It stated: "Whereas, by section 9 of the Metropolis Water Act, 1852, as amended by the Public Health Act, 1875, it is enacted that, if, at any time, complaint as to the quantity of water supplied by the Company for domestic use be made to the Local Government Board by memorial in writing, signed by no less than twenty inhabitant householders, paying rent for, and supplied with, water by the Company, it shall be lawful for the Board at any time within one month on receipt of such complaint to appoint a competent person to inquire into, and concerning the ground of, such complaint, and to report thereon. And whereas, we the Local Government Board have, within one month before the date of this, so received complaint under the said section as to the quantity of water supplied in London by the Grand Junction Water-Works Company, the East London Water-Works Company, the Southwark and Vauxhall Water Company, the Company of Proprietors of the Lambeth Water-Works, and the Company of Proprietors of the Kent Water-Works respectively, now therefore, in pursuance of the powers given to us by the statutes in that behalf, we hereby appoint Major-General Alexander de Courcy Scott, R.E., to inquire into, and concerning the grounds of, such complaint, and to report to us thereon. Given under the seal of office of the Local Government Board this 29th day of March, 1895," &c. Proceeding, the Inspector said that of the number of memorials received with reference to the supply of water, he proposed that day to go into one only—that was a memorial signed by Charles Waller and others, who complained that for four weeks the Lambeth Water Company had failed to supply their houses with sufficient water for domestic use.

Mr. W. Young, the Solicitor to the Wandsworth District Board of Works, said he understood that the memorialists were not represented by a Solicitor; and he asked to be allowed to give them a little guidance in the way in which they gave their evidence. The Board had, in conjunction with a number of householders, sent in a petition to the Local Government Board.

Mr. May, the Solicitor to the Lambeth Water Company, said the Company were in this position: They would naturally have wished to instruct Counsel; so that the facts could have been brought out as clearly as possible, because they had no desire to conceal anything—rather the contrary. He had had to take upon himself the responsibility of advising the Company; and he could not instruct Counsel without having the facts clearly before him. He would therefore suggest that the statements of the complainants be put in writing; and further that, if necessary, he, or Counsel, might appear at a subsequent hearing and cross-examine them on their statements, in order that they might get to the true state of the facts. He did not wish to discuss on this occasion what he might call technical questions; but Counsel might advise them that there were certain technical questions that ought to be raised with reference to this inquiry.

The Inspector said the course he proposed to pursue was to take down the evidence of the memorialists in writing; and this, to a certain extent, would meet the point put before him by the Solicitor to the Company. He recognized that, allegations being made for the first time in the Company's hearing, they had a right to reasonable time to investigate them; but he supposed it would not be necessary for them to ask for an adjournment in every case for the purpose of making inquiry. He did not consider the Local Authority had a *locus standi* in this particular inquiry. As to the legal points which might arise, he proposed to reserve them for reference to the legal officers of the Board; but he thought the investigation on this occasion should be carried on by himself. The person appointed to hold the inquiry came there as an expert; and he was conversant with the questions which were to be investigated. It must therefore rest upon him to regulate the inquiry.

The memorialists were then called upon to give evidence in support of the petition. Their testimony was in every respect very similar; and we therefore give a summary of the statement made by their principal spokesman—Major Waller—and simply indicate any interesting points arising subsequently.

Major *Waller* stated that he resided at Clarence Lodge, Clapham Park, which was rated at £250 a year gross; and he paid a water-rental of £15 per annum. During the whole of the period of the frost, he received an ample supply of water; but on the disappearance of the

frost, on Feb. 19, the supply ceased. He sent to the Water Company; and was told that his pipes must be frozen. He had them thoroughly examined by a plumber; and they were found to be perfectly free from obstruction. He again complained to the Water Company, and was informed that their mains were not frozen, and that the obstruction must be in his own pipes. A second examination, however, failed to show that anything was wrong. He sent a third time to the Company, and was then told that the stoppage must be in the communication-pipe, and that it was his duty to clear the pipe, if he could get the sanction of the District Surveyor to open the road. He made application to the District Surveyor on Feb. 21; and on the 23rd he received a message from him that it was not his (Major Waller's) duty to open the road, but that of the Water Company. He, however, ultimately succeeded in obtaining permission; and then he found the pipe was frozen close to the stopcock. He procured a supply, which continued fairly well until about March 9, when he was suddenly deprived of water above the basement level. This continued until March 23, on which date the water reached his cisterns; but on certain days the supply had been intermittent.

There was some discussion at this stage as to importing Counsel into the inquiry. Mr. May was of opinion that Counsel would be of assistance in elucidating some of the points; while Major Waller intimated that, if the Company were going to be represented by Counsel, the memorialists would desire to have their case laid before the Inspector by Counsel, though, of course, they did not wish to go to the expense. The Inspector rather discouraged the proposal, and ended the discussion by stating that he would reserve the question.

Mr. *J. O'Dell*, of Loates Road, Clapham Park, gave corroborative evidence as to the failure of the supply, and stated that the Company's main opposite his house was only 1 ft. 4½ in. below the surface of the road. There had been two or three bursts in the road; and the old pipes had been replaced by new ones. Although ice was found by the men in the old pipes, the new ones had been laid at the same depth. The pipe was 3 inches in diameter.

The evidence of neighbours of the last witness—Mr. *F. Tillett*, Mr. *G. S. Millar*, Mr. *S. Saxby*, Mr. *C. Overwake*, and the Rev. *Charles Price*—generally agreed with that already given. From measurements they or their plumbers had made, they gave the depths of the pipes in front of their respective residences at from 1 ft. 2½ in. to 1 ft. 6 in.; and the last-named witness stated that new pipes had been laid since the frost at a depth of 1 ft. 8 in.

Mr. *Arthur Southam*, the Surveyor of the District Board, also tendered evidence as to the depths of mains and communication-pipes in the neighbourhood. In the cases he cited, the depths of the Company's mains ranged from 1 ft. 2 in. to 2 ft. 6 in.; the communication-pipes, from 1 ft. 6 in. to 2 ft. 6 in.; and the latter pipes at the stopcocks, from 1 ft. to 1 ft. 9 in. His figures referring to Loates Road confirmed those of the previous witnesses. He had found in roads recently formed that the communication-pipes were not quite 2 ft. deep. Generally the pipes were much less in depth at the stopcocks than at other parts. As a rule at that point they were not more than 1 ft. 6 in. Only a week previously, two communication-pipes were laid at 1 ft. 10 in. and 1 ft. 6 in. respectively. Witness was proceeding to give evidence as to the depth of pipes on the south side of Clapham Common, when

Mr. MAY objected, on the ground that that portion of the district was not touched by the present petition.

The INSPECTOR said he regarded the whole of the Company's supply as a unit; and the non-supply of water in one locality might arise from a defect in another district.

Mr. H. WILKINS, the Secretary of the Company, said the Engineer (Mr. T. F. Parkes) assured him that the pipes in question would not affect the locality covered by the petition.

Witness (continuing) said the main along the south side of Clapham Common was a 4-inch one; and its depth varied from 1 ft. 2 in. to 1 ft. 11 in. During the recent frost, this main was frozen. He had a very strong opinion himself that the mains were not at a sufficient depth. He had been the District Surveyor for upwards of 20 years. They had had many severe frosts, and had had trouble every winter, but not so great as on this occasion. In his opinion, if the pipes were laid at a depth of 3 feet, and there was a constant supply, even with such a frost as had been experienced recently, there would be no interruption of the supply. Where mains had been at a depth of over 2 feet, and there had been a fair supply of water, there had been no stoppage. He did not know of any particular instance where the roads had become shallower by the process of time; it was more likely that they would be raised. In reply to Mr. Wilkins, he added that, in making new roads, it was very rarely they reduced the level, as carting the material away was very expensive.

Mr. *E. Rawlings*, of Clapham Common, spoke of the failure of his supply, and accused the Company of having made no attempt to alleviate the sufferings of the residents in his neighbourhood. Standpipes were put up; but at inconvenient distances. It was stated by the Company that it was impossible for the pipes to be repaired, for the reason that new pipes could not be obtained, nor could sufficient men be found to do the work. Some of these mains had been frozen for two months; and he should have thought that any water-works engineer would have known that bursts of considerable magnitude would ensue, and would have made provision accordingly.

This concluded the evidence of the memorialists; and it was agreed to adjourn the proceedings to the 25th inst.

Last Thursday, the second of the series of inquiries by Major-General Scott, into complaints made by householders as to the failure of water supply during the recent frost, was opened at Wandsworth, when a memorial of 20 householders was presented against the Southwark and Vauxhall Water Company. The memorial alleged that, owing to the Company's mains having been laid at a depth insufficient to guard against frost, the complainants had been from six to eight weeks without any water supply, except such as they had had to fetch at their own expense. Several witnesses gave evidence in support of this statement; and General Scott intimated that he should require from the Companies a specific statement of the condition of their mains throughout the whole of the districts complained of. The inquiry was then adjourned till the 26th inst.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of February.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the month of February, show that the average daily supply amounted to 220,149,332 gallons, as compared with 187,920,100 gallons in the corresponding month of 1894. The number of services being 812,799, the rate was 271 gallons to each service. Of the entire bulk of water sent out, 97,386,515 gallons were drawn from the Thames, and 122,762,817 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·8; Tottenham, 1·2; New River and Colne Valley, 1·6; East London (deep well), 2·1; Grand Junction, 2·2; Lambeth, 2·3; West Middlesex and Southwark, 2·7; Chelsea, 3·1; and East London (river supply), 3·4. The unfiltered river waters contained the following proportions: Thames at Hampton, 2·6; New River Cut, 1·8; and the Lea at Angel Road, 3·2. The Thames at Hampton was, on Feb. 4, turbid and pale yellow in colour, but otherwise chemically in excellent condition, containing only a very small proportion of organic matter. Bacterially it was exceedingly bad, even after storage for fourteen days. As delivered by the five Companies drawing from this river, it was in every case efficiently filtered before delivery. The bacterial improvement effected by the various Companies is expressed by the following percentage numbers: Chelsea, 99·32; West Middlesex, 99·16; Southwark, (No. 4 filter well) 81·71, (No. 7 filter well) 98·89; Grand Junction, (general well at Hampton) 85·55, (general well at Kew, Feb. 5) 99·85, (ditto, Feb. 16) 99·66, (Kew south well, Feb. 5) 99·88, (ditto, Feb. 16) 99·89; and Lambeth, 96·55. The New River Cut, before entering the subsidence and storage reservoirs, was, on Feb. 6, turbid and of a very pale yellow colour. It possessed a high degree of organic purity; but it was, both before and after storage, of bad bacterial quality. After filtration, the New River Company delivered it in a clear and bright condition, and improved it bacterially to the extent represented by the following percentage numbers: General filter well, 98·48; and No. 4 filter well, 98·89. The water taken from the Lea at Angel Road by the East London Water Company was, on Feb. 6, turbid and pale yellow. It was of good chemical, but very bad bacterial quality. Even after storage for fifteen days, it contained 37,200 microbes or their spores per cubic centimetre. It was efficiently filtered before delivery, and improved bacterially, to an extent represented by the following percentage numbers: No. 1 Essex well, 89·78; No. 2 Essex well, 95·31; and Middlesex well, 98·39. The deep-well waters of the Kent and Colne Valley Companies, and of the Tottenham Local Board of Health, possessed a high degree of organic purity, and were of excellent quality for dietetic purposes. The Tottenham and East London waters were very slightly turbid; but the others were clear and bright without filtration. The Colne Valley Company's water was softened before delivery, and thus rendered suitable for washing. Seen through a stratum 2 feet deep, the Kent and Colne Valley waters were clear and colourless; the Tottenham and East London (deep-well), colourless and very slightly turbid; the New River, clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacterioscopic examination of the raw river water before and after storage, and of the supplies of the various Companies collected on the 4th, 5th, 6th, 15th, and 16th of February, furnished the results contained in the following table:—

Description.	No. of Microbes per Cubic Centimetre.	Temperature in Deg. C.
Raw and Stored River Waters.		
Thames at Hampton, Feb. 4	34,220	0·8
" after storage for 14·7 days (Chelsea Company), Feb. 4	26,800	0·5
New River Cut before entering reservoirs, Feb. 6	14,440	1·4
" " after storage but before filtration, Feb. 6	14,580	1·4
River Lea at Angel Road, Feb. 6	50,860	0·1
" after storage for 15 days (East London Company), Feb. 6	37,200	0·2
Filtered River Water as Supplied.		
Thames—		
Chelsea, general filter well, Feb. 4	232	0·5
West Middlesex, general filter well, Feb. 5	286	0·4
Southwark, No. 4 filter well, Feb. 4	6,260	0·5
" No. 7 filter well, Feb. 4	380	0·4
Grand Junction, general well at Hampton, Feb. 4	4,944	1·1
Grand Junction, general well at Kew Bridge, Feb. 5	52	0·5
Grand Junction, general well at Kew Bridge, Feb. 16	116	0·8
Grand Junction, south filter well at Kew Bridge, Feb. 5	44	0·5
Grand Junction, south filter well at Kew Bridge, Feb. 16	36	1·1
Lambeth, general filter well, Feb. 4	1,180	1·0
Lea—		
New River, general filter well, Feb. 6	220	1·2
" No. 4 filter well, Feb. 6	160	1·2
East London, No. 1 Essex well, Feb. 6	5,200	0·2
" No. 2 " Feb. 6	2,384	0·2
" Middlesex well, Feb. 6	820	0·2
Deep well—		
Kent, Bath well at Deptford, Feb. 15	8	11·3

This table shows that a continuance of very low temperatures during the month again prevented most of the filters from working efficiently. Indeed, the results were in nearly all cases more unsatis-

factory than even during the previous month; for, although there was in every case a great reduction in the number of microbes per cubic centimetre, it was only in some of the filters of the Grand Junction Company that the number was brought within the standard limit of 100 per cubic centimetre. The enormous increase in the consumption of water during the frost, taxing, as it did, the filters to the utmost, probably contributed to this unsatisfactory result. Nevertheless, it is obvious that there are other conditions affecting bacterial filtration during frost which require investigation. From this point of view, it is both interesting and important to compare the results obtained by the Grand Junction Company at Hampton, where the raw water operated upon contained 34,220 microbes per cubic centimetre, with those obtained at Kew, where the water supplied to the filters, having undergone a preliminary filtration, contained only 880 microbes per cubic centimetre. The filtered water at Hampton still contained 4944 microbes per cubic centimetre, while that at Kew contained only 52. It would thus appear that, in very cold weather at least, the initial number of microbes has an important influence upon the number in the filtered water. And this conclusion is borne out by reference to the results obtained by the other Companies drawing from rivers; for, in every case, as is seen from the above table, the greater the number of microbes in the raw water, the larger the number passing the filters. My bacterioscopic observations, made during the recent severe weather, have further shown that storage in open reservoirs, even when prolonged for fifteen days, has, at temperatures near the freezing-point, but little effect in reducing the number of microbes in the raw river waters. On the other hand, it would seem that passage through a deep layer of gravel is a potent means, even in severe weather, for the retention of microbes. The higher temperature to which the water is exposed in this deep gravel is, no doubt, the cause of this bacterial efficiency of preliminary filtration. Nothing of an injurious character was found among the microbes in any of the waters.

In their report to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.) on the composition and quality of the water supplied to London during February, as ascertained by tests of samples taken at various times and places on behalf of the Water Companies, Messrs. Crookes and Dewar say: Of the 58 samples examined, one was recorded as "slightly turbid," and four as "clear but dull." The remainder were clear, bright, and well filtered. The unprecedented frost which visited the Thames Valley during the month of February prevented many samples being drawn for analysis; and it is difficult to make any fair comparison between the chemical composition of the waters during that month and the corresponding month last year, or with the months of December and January just preceding. It will therefore be sufficient to say that in every respect the freedom from pollution is of a very high character; the organic carbon and the brown constituent of the colour having diminished to about one-half the usual figures. Bacteriological observations have been carried on during the whole of the month. Performing the operations in exactly the same manner as we have been accustomed to do them from the commencement, so as to admit of the results from month to month being strictly comparable among themselves, and keeping the culture-plates incubating for 48 hours, the waters from the general wells have an average of 44 bacteria per cubic centimetre; that from the river at Hampton Court before filtration containing 7334. Many localities in the south-east and east districts of London having had their service-pipes frozen, the water from Aldgate pump was largely resorted to for domestic purposes. This has been for many years supplied from the New River Company; and it may interest consumers to know that analysis shows that the pump water is very pure, and is identical in composition with New River water from other localities. It was found to contain 133 microbes per cubic centimetre.

COLCHESTER CORPORATION WATER-WORKS.

The Water Committee's Expenditure.

At the Meeting of the Colchester Town Council last Wednesday week, the Water Committee reported that, in addition to £12,000 already borrowed, £3473 would be required to complete the new water-works; and they recommended the Council to apply for sanction for borrowing £3500. When application was made for sanction to the borrowing of the £12,000, the Committee hoped to be in a position to provide out of revenue the difference between that sum and the total cost; and, in fact, they would now be able to do so did they not deem it absolutely essential that the surplus revenue should be applied in immediately executing other works. The amount now at the disposal of the Council was: Estimated surplus of revenue, £2775; amount realized by sale of old pumping plant, £175; estimated value of old buildings, &c., £50—total, £3000. It was suggested that this sum should be applied in paying for the new valve chamber floor, and various other works. Objection was raised to this "vast expense" by Mr. Clamp; and Mr. Peck said the Committee had spent above £3500 more than had been authorized; and now they came to be "whitewashed." As a matter of fact, when permission had been given to borrow the £12,000, the Chairman of the Committee stated that, after paying all expenses, and allowing for depreciation, they would have a clear £1000 a year to hand over towards the reduction of the rates. Where was it? The Committee told them that they had £2700 in hand, which corresponded almost precisely to the surplus they ought to have according to the statement made by the Chairman. He moved, as an amendment to the adoption of the report, that £2000, a portion of the £2775 in the hands of the Committee, being surplus revenue, be paid over for the relief of the next rate, which would be equal to a reduction of 5d. in the pound. Mr. Arnold seconded this. One of the Aldermen, in the absence of the Chairman of the Committee, spoke of Mr. Peck's speech as a facetious indictment of the Water Committee. It was inaccurate that the Committee had given the Council to understand that they would only want £12,000. They required £15,000, and presented a bill which the Council apparently had not understood. The application now made was for funds necessary to complete the undertaking; and this would, he believed, be the last application that would be made. The Deputy-Mayor (Mr. Goody) remarked that it had been held out to them for years that the halcyon period would arrive when the rates would be paid out of the revenue of the water-works. Mr. J. F. Goodey entered on a defence of the Committee, showing that the expenditure they had been led into had been absolutely necessary; and Mr. Penney endorsed this. Mr. Marriage thought the Committee had served the town well under trying circumstances, and suggested that the matter should be adjourned for the attendance of the Chairman. This course was adopted.

STOCKTON AND MIDDLESBROUGH WATER BOARD.

Half-Yearly Accounts—New Filter-Beds.

The Stockton and Middlesbrough Water Board have submitted to the constituent authorities the following report on their finances: The accounts of the Board for the half year ending Feb. 14, 1895, show the capital expenditure for the six months to have been £37,285; bringing up the total cost of the undertaking to £1,734,099. Of the capital expenditure during the half year, the principal items are: On account of the Hury reservoir, £858; Blackton reservoir, £7512; flood-water channel, £680; Lartington tank and filter-beds, £1296; conduits Nos. 2, 3, and 4 (gravitation main), £21,216; Whorley reservoir, £3380; Engineer's commission, £1000; and extension of supply mains, £657. The sums received on capital account during the half year amount to £35,189; bringing the total up to £1,725,170—being £8929 less than the amount expended. The revenue account shows the income to have been £31,969; being a decrease of £612 as compared with the preceding half year, and an increase of £292 as compared with the six months ending Feb. 14, 1894. Since the last report, the works in connection with the supply of water by gravitation from the Balder have been so far completed that pumping from the river at Broken Scar is for the present discontinued except as regards the water required for washing the sand for the filters. As only the Hury reservoir is completed, there is not yet the possibility of "sorting" the water, which will be afforded by the completion of the Blackton reservoir in the early part of next year; so that for some time the colour of the water as delivered in the district will not be so good as may be expected when the "sorting" can be done at Hury, and the water filtered at the proposed filter-beds at Lartington. In the meantime, the district is to be congratulated on having at last obtained an abundant supply of excellent water, free from the suspicion of any sewage contamination; and the Board hope that the burden which the attainment of this object has placed on the ratepayers of the three boroughs may be removed by the steady growth of the revenue of the undertaking. At the meeting of the Water Board last week, it was decided to ask Mr. J. Mansergh to prepare complete plans and specifications for the filter-beds at Lartington, which, it is expected, will effect a saving of £1178 a year by the discontinuance of pumping operations at Broken Scar.

Cape Town and District Gaslight and Coke Company, Limited.—After writing off £2231 for repairs and maintenance for the year, and £2080 off preliminary expenses, &c., account, the Directors of this Company recommend a final dividend at the rate of 6 per cent. per annum for the half year ended Dec. 31, carrying forward £1351.

New Joint-Stock Water Companies.—The Barton-upon-Humber Water Company, Limited, has been formed with a capital of £10,000, in £10 shares, to acquire by purchase the undertaking of the Barton-upon-Humber and District Water Company, Limited, and to carry on the business. The Buluwayo Water-Works Company, Limited, with a capital of £200,000, in £1 shares, is to adopt and carry into effect an agreement expressed to be made between Willoughby's Consolidated Company, Limited, of the one part and the Buluwayo Company of the other part, and to supply the town of Buluwayo, Matabeleland, and the suburbs and neighbourhood thereof, or any other town or district in South Africa, with water, and to carry on the general business of a water company.

San Paulo Gas Company, Limited.—The Directors of this Company report that the balance of the revenue account for the half year ending Dec. 31 last is £13,731. After payment of debenture interest, and making provision for contingencies, there remains a balance of £9386, which, added to the £2182 brought from the previous six months, makes a total credit of £11,569 on the profit and loss account. The Directors recommend a dividend of 4 per cent. for the half year, free of income-tax, which will absorb £10,000; making, with the interim dividend paid in October, 1894, 7 per cent. for the year—the balance of £1569 to be carried forward. The revenue receipts and expenditure have been converted at 10¾d. per milreis, the average rate ruling during the six months. The sale of gas shows a steady increase; and the works and plant have been maintained in an efficient state. The health of the Secretary (Mr. J. Heath) not being satisfactory, the Board have granted him six months' leave of absence.

The Bolton Corporation and their Gas Stokers.—As reported in a previous issue of the JOURNAL, the stokers employed at the two gas-works belonging to the Bolton Corporation have for some time been agitating for an alteration of the conditions under which they labour, especially as to the payment for Sunday duty. Had the men's demands been conceded, they would have been in a better position all round than stokers engaged in any other gas-works in the country. They wanted payment at the rate of double time for the three shifts on Sundays; and, as a counter-proposition, the Gas Committee offered time-and-a-half, if the men agreed to carbonize each day 3 tons 12 cwt. instead of 3 tons 8 cwt. The men refused this; and the Committee then recommended the Council to adopt mechanical stoking; this being approved at the last monthly meeting. However, before finally proceeding with its adoption, the Corporation gave the men an opportunity of reconsidering their position. The men did so; and, at a special meeting of the Gas Committee on the 5th inst., they agreed to the proposal made to them, with some modifications. They will carbonize the 3 tons 12 cwt., if cellars are provided at the Gas Street works for the coke when drawn, and shields at the Lum Street works. Upon this the Committee now recommend that the question of the adoption of mechanical stoking be deferred for the present.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Edinburgh has now come into line with the other large Corporations in Scotland in the matter of electric lighting. A portion of the installation which has been under construction for the past year was turned on last Thursday night. "Everybody will be happy" was the opinion Mr. A. D. Mackenzie, the Convener of the Committee who have had charge of the introduction of the light, expressed at a banquet held in celebration of the event. It remains to be seen whether this will be so or not. I confess I am almost staggered by the confidence which was expressed by the speakers at the opening ceremonies regarding the success of the undertaking. It would seem that they are within sight of their first instalment of 40,000 8-candle lamps, and are already looking forward to the second instalment of a like number, by which they expect to be able to reduce the cost of current from 7d. to 4¾d. per unit. What a dream, surely, all this is. It seems to me that the gentlemen must have been simply whistling to keep up their courage. My information is that orders for wiring have come in very tardily, and that some uneasiness has been felt in consequence. It is stated that 20,300 lamps are already applied for. We are not told, however, how many of these are in warehouses which close at six o'clock in the evening, or in banks and insurance offices which close earlier; or how many of them are merely a stand-by. The number of lamps will not do any good to the Corporation unless they are kept in use. If they can persuade people to use the light, they will have their revenue; if they cannot, the number of lamps on circuit will be a weakness instead of a strength. To the 20,300 lamps applied for, have to be added the 175 arc lamps in the streets, which will represent other 3000 lamps; leaving only 16,700 lamps to complete the first 40,000. There is confidence that these will all be applied for in the course of the next nine months or so. I suppose we shall be having motions starting up in every public body for the adoption of the electric light in public buildings, as we have seen in other towns, which will take up one or two thousand of the lamps yet to be wired, and which is a method of bringing revenue to the undertaking out of the pockets of the ratepayers, but not out of the pockets of those who use the light. Mr. Mackenzie, in his remarks at the banquet, said the cost of lighting Princes Street would be about £620 a year, which was about £200 more than it had cost to light it by gas. I am puzzled to know how he can make out so low a charge for arc lighting. All through these proceedings, we have been told that the Corporation of Edinburgh were profiting by the experience of other places. Have they gained to the extent of being able to provide street lighting at a figure at which it does not pay in other towns? There are 27 lamps in Princes Street; and the charge of £620 gives practically £23 per lamp per annum. In Glasgow, they started with a charge of £20 per lamp per annum, which was found to be totally inadequate; and the price is now £26. Even the latter sum, I am informed, is not nearly sufficient; and so, in Glasgow, the actual cost of maintaining an arc lamp in the street must be set down at, say, £30. If the same experience be had in Edinburgh, it is easy to be seen that the cost of lighting Princes Street will be £810, and not £620, a year, as stated—a difference of £190; and that, if the whole 175 lamps which are to be on the circuit are taken into the calculation, the difference between Mr. Mackenzie's estimate and mine would be £1235. Where is the deficit to be provided from? I suppose out of the general police rate, under the power which the Corporation possess of making good any deficit upon the electric lighting undertaking out of the rates. Having written these criticisms upon what was said, I do not wish to appear to be hostile to the undertaking as an undertaking. The only thing which is objectionable about these municipal electric lighting adventures is that the statutes do not require the promoters to balance their accounts, but allow them to abstract the deficits, which always arise, from the pockets of people who not only get no benefit, but may be disadvantaged by the light. I am not aware of any other description of undertaking in which the same provision occurs. Mr. Mackenzie himself spoke rapturously of the benefit which the light in Princes Street would be to shopkeepers in that thoroughfare. Exactly so; but within 100 yards of that proud street there are business premises the occupiers of which are as deserving as the Princes Street merchants, and who may not only lose their customers, but will have to assist their rival in the lighting of his premises. Time will prove whether or not everybody will be happy then. Meantime, I must acknowledge that, so far as can be seen, the works have been substantially constructed, and appeared to be thoroughly efficient. Professor Kennedy has led the way in corporation installations in Scotland; and he has proved himself to have a perfect acquaintance with the engineering of electrical undertakings. On that head, and also with regard to the amount of work, and the care and intelligence which they have brought to bear upon it, not only Professor Kennedy, but also the Convener (Mr. Mackenzie) and the Resident Engineer (Mr. E. W. Monkhouse) deserve all credit. Their policy I cannot approve of, because it is founded on a faulty statute; but their work I thoroughly uphold, as the best which could be given in the circumstances.

At a meeting of the Perth Gas Commission on Monday, Mr. Thomas Whimster, the Gas Manager, reported that during the past month the output of gas from the works was 9,561,300 cubic feet—an increase over the quantity produced in the corresponding month of last year of 1,123,100 cubic feet. It was also reported that the increased revenue from gas during the eleven months of this year amounts to nearly £900. In connection with contracts for the renewal of oil-gas retorts, Mr. Reid moved that the subject be not remitted to the Manager, because, in his opinion, they ought to do away with the oil process altogether; the gas being so dirty that they had to clean their houses twice a year instead of once as before. Mr. Donnelly, in seconding, said that ever since oil gas was introduced they had had nothing but dirty houses; and he was of opinion that they would never have good gas till they reverted to the old practice. This was the view of the uninformed section of the Commission. Lord Provost Dewar pointed out that the adoption of the oil-gas process had led to the saving of a great deal of money; that it had been a considerable improvement; and that for anyone to go there at that time of day with such proposals as had been made, was nothing short of trifling with the time of the Commission. Mr. Wright, the Convener of the Works Committee, said the complaint could not be against the oil gas, but might be due to the cramped condition of the works, which was a strong reason why they should go in for new works without delay. This was the view of the informed section of the Commission; and it was adopted by a large majority. The Commissioners entered into contracts for the supply of 9000 tons of coal, at prices varying from 9s. 9d. to 11s. per ton, delivered in the works; the average price being 10s. 4½d. per ton.

The Town Council of Dunfermline are persisting in their useless attempt to dictate to the Gas Company the terms upon which they are to sell gas to the community. At their meeting on Monday night, the Lighting Committee reported that they had considered the answer which they had received from the Gas Company, and had instructed the Clerk to reply that they did not see their way to confer with the Directors of the Company, unless the Directors agreed to include among the subjects to be considered the main point in regard to which the Commissioners wished to negotiate with them—viz., the price and quality of the gas to be supplied to the inhabitants generally. To this communication no reply had been received. The Town Council adopted the report of their Committee. No further steps were ordered; but the subject is still in existence. The Council may drop it as soon as they please. They might as well seek to govern the price at which grocers in the burgh are to sell provisions to the inhabitants, as to regulate the price of the gas sold by the Company.

The disturbance in the Lockerbie Corporation Gas-Works, to which I referred last week, ended, on Saturday last, in the conviction in the Burgh Court of Alexander Jardine, joiner, one of the Commissioners, on a charge of having assaulted a labourer in the gas-works on the 1st inst. The story was a wretched one. The accused Commissioner went to the works on Sunday, the 31st ult.; and it appeared that the workman appealed to him to stand out of the way while a retort was being drawn, and that when he showed no alacrity to comply the man pushed him aside. While the coke was being quenched, some of the water went upon him; but whether it was done intentionally or not was not made clear. Next day the accused returned to the gas-works, and had an altercation with the workman, which consisted in bandying remarks about being in certain gas-works, and in the accusation by the Commissioner that the workman was a tramp. The Commissioner left the works, and the workman continued to sit against a wall. After he had left, the Commissioner returned, and threw several pieces of coal at the man, one of which, said to weigh about 2 lbs., struck him on the face, inflicting a wound. There was no evidence for the defence; but the Magistrate who tried the case, himself a Commissioner, would not believe that the assault could have been witnessed, and he adjourned the Court till he had visited the works. On returning, he said he was satisfied that the affair could have been seen by the only witness who spoke to it; and he convicted the accused, and fined him 7s. 6d. He asked the accused not to go back to the gas-works; but he would not undertake not to do so. On Monday night, there was a talk at the Gas Commission meeting of protecting their brother Commissioner; and his offence was toned down by the remark that it was his excess of zeal that had led him into the little scrape. Strange zeal, I should say, which leads a Commissioner to go back 24 hours after a difference with a workman and assault him. Happily such instances are rare. The accused was the same man who was put out of the gas-works by the Manager's wife a few months ago, and for which action the Commissioners decreed that the Manager should apologize to the Commissioner. The Commissioners apparently support their brother still. What a state of matters! It is impossible that the gas-works could be properly worked with incidents like these occurring.

The Scotch oil trade, at a meeting in Glasgow on Tuesday, resolved to advance the price of oil by 1d. per gallon. This will affect the price of oil for gas making. There is an expectation that a further advance may be made; and it is reported that, in the meantime, sellers are averse to entering into forward contracts.

Sulphate of ammonia is reported as selling at from £10 5s. to £10 7s. 6d. per ton; and further reductions are expected.

Reduction in Price.—The Gas Committee of the Stockport Corporation have reduced the price of gas 2d. per 1000 cubic feet; making it 2s. 6d. within, and 3s. beyond the borough.

Increased Storage at the Boston Spa Gas-Works.—Messrs. R. Dempster and Sons, Limited, have secured the contract for a 46 feet diameter steel tank and holder prepared for telescoping, together with the concrete foundation required, for the Boston Spa Gas Company.

Extensions at the Knaresborough Water-Works.—The Gas and Water Committee of the Knaresborough District Council have lately had under consideration amended plans, submitted by their Gas and Water Manager (Mr. T. Settle), for a water-tank; and they have accepted the tender of Messrs. R. and J. Dempster, Limited, for its erection.

James Milne and Son, Limited.—The fourth statutory meeting of this Company was held last Wednesday. The Directors' report recommended the declaration of a dividend for the past year of 6 per cent. on the preference shares, and dividends for the past half year at the rate of 6 per cent. per annum on the ordinary shares and 2 per cent. per annum on the deferred shares. The Chairman (Mr. James Milne), in moving the adoption of the report, stated that he thought this was a highly gratifying result, and a hopeful indication for the future. The report was unanimously adopted.

Sales of Shares.—Twelve £25 shares in the *Wellingborough Gas Company* (the dividend on which for several years past has been 11 per cent., free of income-tax) were sold by auction last Tuesday at prices ranging from £59 2s. 6d. to £59 15s.; and three debenture bonds of £100 each, bearing interest at 4 per cent., realized £101 5s., £102, and £102 10s.——At a sale of miscellaneous shares at Lincoln on the 5th inst., £10 shares in the *Market Rasen Water Company* realized £15 5s. each.——At a recent sale of *Tonbridge Gas Company's* stock, the "A" stock, paying a dividend of 10½ per cent., realized more than double its original value; while the "B" 7½ per cent. stock fetched £32 premium.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 11.

Sulphate of Ammonia.—The market still wears a very quiet appearance; and prices are rather easier as compared with last week. There has been a little more doing for shipment; but buyers continue to have much their own way. The supply is ample; and almost every transaction is reported at a decline in previous business. The outlook for the immediate future is not very encouraging; but it is expected that there will soon be a demand for the Colonies, which may improve matters. Prices show much irregularity, and are quoted generally about £10 5s. to £10 6s. 3d. at Liverpool and Leith; whereas Hull is nominally quoted at the latter figure. Nitrate of soda fetches 8s. 6d. per cwt.

LONDON, *April* 11.

Tar Products.—There is a much better inquiry for carbolic acid crystals; and accumulated stocks have now disappeared. The improved value of crystals, however, has not so far affected the price of crude, although there is a much readier market for the latter than has existed for some time. Pitch continues to be sold at firm rates; as much as 34s. having been paid for next season's delivery at a good port. Benzol is flat, particularly 50 per cent., which seems to be difficult to sell at the nominal rate quoted below. Solvent naphtha is also neglected; but the season for it is now approaching when better prices are likely to be obtainable. There is no change in anthracene. Prices: Tar, 18s. to 21s. Pitch, 32s. 6d. to 34s. Benzol, 90's, 1s. 0½d.; 50's, 1s. Solvent naphtha, 1s. Toluol, 1s. 1½d. Crude, 30 per cent., naphtha, 4½d. Creosote liquid, 1½d.; ordinary, 1d.; salts, 20s. Cresylic acid, white, 1s.; brown, 10d. Carbolic acid, 60's, 1s. 5½d. Anthracene, "A," 1s. 1d.; "B," 10d.

Sulphate of Ammonia is in a bad way. Buyers are holding aloof, and "bear" dealers are exaggerating the quantity of stuff in stock. This, combined with the light season, has completely demoralized the market. Very little new business is reported; and to-day's quotation ranges from £10 5s. to £10 7s. 6d. in all positions, less 3½ per cent. Gas liquor, 7s. to 8s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The steadily increasing depression which has been coming over all classes of round coal for some time past—and especially as regards the lower descriptions—necessarily tends to weaken the position of colliery proprietors in relation to the ensuing season's contracts for gas coals. These are now coming upon the market; and judging from some of the tenders that have already been sent in, there is likely to be some excessively low cutting to secure contracts. Some of the prices that are being quoted are quite 1s. 3d. under those obtained last year, when it was very exceptional where more than 3d. over the previous year's low figures was secured. It is as yet difficult to give anything like definite prices; but ordinary partially-screened Arley gas coals have been offered at prices which scarcely leave more than 7s. 6d. per ton at the pit mouth. What ordinary Wigan four-feet gas coal will be offered at, it is difficult to say. With regard to the general condition of trade, all descriptions of round coal are in very slow request, with many pits not working more than four days per week, and a good deal of irregularity in prices where anything like quantities are concerned. Best Wigan Arley only in exceptional cases is fetching more than 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; common house-coals, 7s. to 7s. 6d.; with steam and forge coals ranging from 6s. upwards. In the shipping trade, the demand is extremely dull, with Lancashire steam coal delivered at the ports on the Mersey ranging from 7s. 6d. up to 8s. and 8s. 3d. per ton. For engine classes of fuel, there is a fair inquiry; and as the production of slack is just now necessarily limited, prices are steady at about 3s. 6d. and 4s. per ton at the pit mouth for common, to 4s. 6d. and 5s. for the better qualities.

Northern Coal Trade.—The coal trade of this district has been very irregular the last few days—holidays lessening the production, and causing some depletion of stocks. Every week, too, more of the Baltic ports are open; so that there is this counterbalance for the falling off in the home gas and household consumption. On the other hand, prices are weakened by the condition of the Coal Sales Association; and contracts are being taken in some cases at prices much below those that have ruled this year hitherto. Best Northumbrian steam coals are fairly steady; and the production is increasing with the enlarging northern demand. Current prices are 8s. 9d. per ton f.o.b. for best, and 3s. 9d. to 4s. for steam smalls; but in some cases a fall is expected through the reduction in the wages of the miners by the decision of the Conciliation Board. In respect of gas coals, sales are taking place at very irregular prices; but in the case of contracts, there is usually a lower range of rates, and about 6s. 3d. to 6s. 4½d. per ton seems now likely to be looked upon as the price that will rule for large contracts between now and the end of the half year. Meantime, it is believed that parts of contracts are being placed at rather higher rates. Manufacturing coals are steady. The coke trade barely holds its own, for there are fewer furnaces at work in the Cleveland district, though one or two more have been relit in West Cumberland. Best Durham coke is quoted from 12s. 6d. to 13s. per ton f.o.b.; and the exports are maintained at about the recent average. Stocks of gas coke are in some cases diminishing; but there is no alteration in the price this week. It is anticipated that there will be soon a reduction of wages in the Durham coalfield, to follow that in Northumberland; but this has practically been anticipated by the coalowners in the quoted prices, and little alteration is expected therefrom.

Scotch Coal Trade.—There is still depression, with no appearance of improvement. The only variety of coal for which there is anything like a satisfactory demand is ell. So long as the wages question remains unsettled, there is little hope of improvement. A meeting of the men's representatives was held in Glasgow on Wednesday, at which it was resolved to submit the question of the proposed reduction of 6d. per week to a special meeting of the British Federation, and that the men be asked to state their views upon the reduction. It is fully anticipated that the men will acquiesce in the reduction. The prices quoted are: Main, 6s.; ell, 7s. to 7s. 3d.; splint, 6s. 6d. to 6s. 9d.; and steam, 7s. 6d. to 7s. 9d., f.o.b. Glasgow. The shipments for the week amounted to 137,961 tons—an increase of 14,383 tons upon the previous week; but a decrease of 4833 tons upon the quantity in the corresponding week of last year. For the year to date, the total shipments have been 1,469,161 tons—a decrease of 368,463 tons upon the quantity in the same period of last year.

The Price of Gas at Staveley.—A meeting of gas consumers has been held at Staveley to protest against what is termed the "exorbitant" price of gas (4s. 3d. per 1000 cubic feet) in the district. A deputation was appointed to wait upon the Gas Company, with the view of securing a reduction in the charge.

Exhibitions of Gas Appliances.—An exhibition of gas appliances which had been arranged by the Gas Department of the Selby District Council, was opened yesterday week in the Public Rooms of the town. A course of practical cookery lectures was delivered during the week by Miss Holroyd, of the Yorkshire School of Cookery. A very successful exhibition of gas appliances, arranged by Messrs. R. and A. Main, of Glasgow, was opened by Lord Provost Dewar in the City Hall, Perth, last Wednesday. Miss Burdon gave demonstrations in cookery.

The Public Lighting of Lowestoft.—The Lowestoft Gas Company have offered to fix 50 incandescent gas-lights in existing lanterns in the principal streets of the town, and maintain them for twelve months from June 24 next, and light them, in accordance with the authorized times, for 2250 hours, for £2 8s. 9d. per lamp, all expenses and gas included—this being the price per lamp of the contract now running—and to remove them and re-fix the governors and burners now in use free of cost to the Corporation, if the Directors found they could not succeed with this mode of lighting. The price of gas to the existing lamps will be lowered 1d. per 1000 cubic feet after June 24; thus making it 3s. 4d. per 1000 cubic feet. The offer was accepted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 792.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	21–22*	..	4 15 5
100,000	10	,,	7½	Do. 7 p. c.	10	14–15*	..	5 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 4
200,000	5	14 Nov.	6½	Bombay, Limited	5	6⅞–7	+⅛	4 12 10
40,000	5	,,	6½	Do. New	4	4⅞–5⅛	+⅛	4 19 2
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	243–248	..	4 12 8
180,000	,,	,,	8½	Do. New	100	195–200	..	4 5 0
220,000	Stck.	14 Mar.	11	Brighton & Hove Original	100	220–225	..	4 17 9
888,500	Stck.	28 Feb.	5	Bristol	100	120–123	+2	4 1 4
320,000	20	28 Mar.	11½	British	20	50–51	..	4 8 2
50,000	10	14 Mar.	11½	Bromley, Ordinary 10 p. c.	10	21–22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16–17	..	5 0 0
328,750	10	14 Nov.	2	Buenos Ayres (New) Limited	10	6¼–6½	..	2 19 3
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100–103	..	5 16 7
150,000	20	28 Feb.	8½	Cagliari, Limited	20	26½–27½	..	6 0 0
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	283–288†	+2⅝	4 13 9
165,000	,,	,,	10½	Do. New do.	100	212–217*	+2½	4 16 9
160,762	,,	13 Dec.	4½	Do. 4½ p. c. Deb. do.	100	130–135	..	3 6 8
800,000	Stck.	13 Dec.	13	Continental Union, Limited.	100	247–252	..	5 3 2
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	205–210	..	4 15 3
535,600	Stck.	28 Feb.	5½	Crystal Palace Ord. 5 p. c. Stk	100	118–123	..	4 5 4
486,090	10	31 Jan.	11	European, Limited	10	24–25	..	4 8 0
354,060	10	,,	11	Do. Partly paid	7½	17–18	..	4 11 9
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	267–272	..	4 8 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105–110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	275–280	..	3 11 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	197–202	..	3 14 3
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	183–188	..	3 14 6
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	275–280	..	3 11 5
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	163–168	..	3 11 5
1,061,150	,,	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	128–131	..	3 1 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	140–145	..	3 2 1
908,000	,,	,,	6	Do. 6 p. c. do.	100	188–192	..	3 2 6
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	242–244	..	4 17 7
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd.	5	5⅞–6⅛	..	4 16 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p.c. Deb.	100	109–111	..	4 10 1
541,920	20	14 Nov.	5	Monte Video, Limited	20	15¼–16½	..	3 1 2
150,000	5	29 Nov.	8	Oriental, Limited	5	7–7½	..	5 6 8
60,000	5	28 Mar.	7	Ottoman, Limited	5	4½–5	..	7 0 0
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	5 0 0
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	105–109	..	5 10 1
500,000	100	1 Dec.	6	2nd Do.	100	102–107	..	5 12 1
150,000	10	11 Oct.	7†	San Paulo, Limited	10	9–10	+⅛	7 0 0
500,000	Stck.	14 Feb.	15½	South Metropolitan, A Stock	100	350–360	..	4 6 1
1,350,000	,,	,,	12	Do. B do.	100	293–295	+⅛	4 0 6
290,000	,,	,,	13	Do. C do.	100	305–310	..	4 3 10
775,000	,,	16 Jan.	5	Do. 5 p. c. Deb. Stk.	100	167–172	..	2 18 2
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	28 Dec.	10½	Chelsea, Ordinary	100	278–283	..	3 11 6
1,719,514	Stck.	10 Apl.	8	East London, Ordinary	100	215–220*	−1	3 12 9
654,740	,,	28 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147–152	..	2 19 2
700,000	50	13 Dec.	8½	Grand Junction	50	109–113	..	3 15 3
708,000	Stck.	14 Feb.	12	Kent	100	303–308	+3	3 17 11
1,043,800	100	28 Dec.	9½	Lambeth, 10 p. c. max.	100	245–250	..	3 16 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200–205	+2	3 13 2
330,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	134–138	+2	2 17 11
500,000	100	14 Feb.	12⅜	New River, New Shares	100	370–380	..	3 7 0
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk.	100	140–143	..	2 15 11
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	148–153	..	3 18 5
126,500	100	,,	6	Do. D 7½ p.c. do.	100	140–145	..	4 2 9
1,155,066	Stck.	13 Dec.	10	West Middlesex	100	268–273	..	3 13 3

*Ex div.

† Next dividend will be at this rate.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

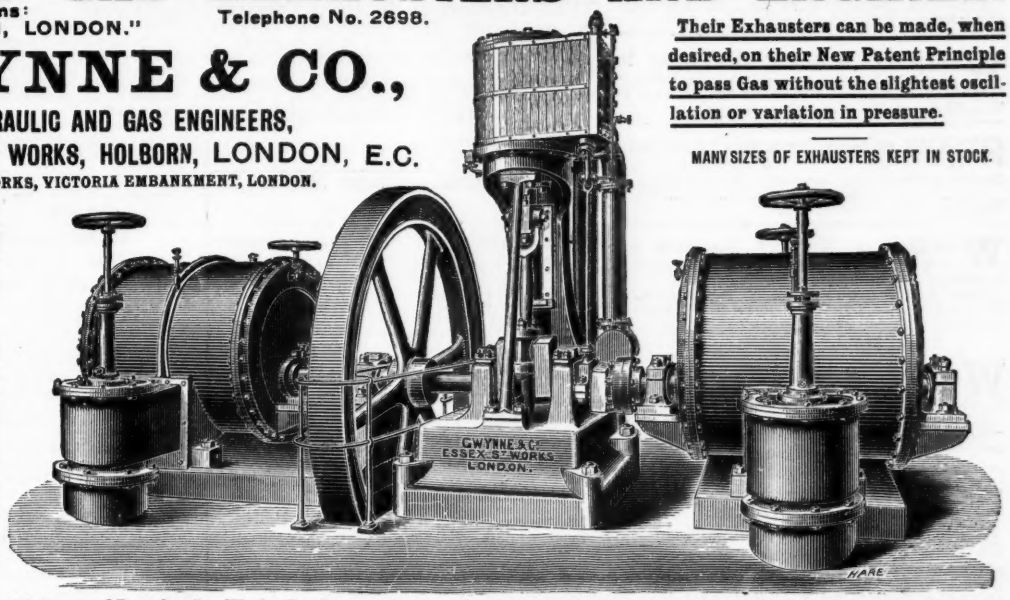
They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director,
Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON,
182, GRESHAM HOUSE,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
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Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
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Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.
*** See Advertisement p. 782 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
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WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

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SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
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Telegrams: "BOGORE, LONDON."

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FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

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ACCUMULATION of thick Tar entirely prevented. A great reduction in Stopped Ascension-Pipes by using CARPENTER'S PATENT HYDRAULIC MAIN CLEANER. No expense beyond first cost.
All Particulars on application to S. & H.W. CARPENTER, Vulcan Iron-Works, Rhodeswell Road, Limehouse, LONDON, E.

A YOUNG Man (aged 28) wants Situation as WORKING MANAGER or FOREMAN. Thoroughly understands the Manufacturing and Distributing of Gas, Mains and Services, Meter Fixing, Inspecting and Fitting in all its Branches, and can undertake House-Fitting, if required. Always resided on Company's Works.
Address No. 2512, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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ADVERTISER, who, for the past 3½ years, has been successfully Manager and Secretary of a small Gas-Works in N.S.W., Australia, paying 8 per cent. in the face of floods and bad times, being desirous of a change, would take a position as ASSISTANT in large, or as SECRETARY and MANAGER in medium sized Works. Thorough practical Mechanic in all branches (Repairs a Speciality). Twenty years' practical experience as Mechanic, Meter Inspector, District Inspector, Manager and Secretary. Gained Certificate in Chemistry and Mechanical Drawing; also first class in Ordinary and second class in Honours Examination, City and Guilds of London Institute. Total abstainer; age 36; and married. Would act as Agent or Traveller for English Firm. Highest references as to moral character.
Address "RADIARY," G.P.O., SYDNEY, N.S.W.

£5 will be given to any person procuring Advertiser a Situation as METER INSPECTOR or CLERK. Four years' experience in large Gas Office.
Address No. 2510, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a young Gentleman to assist in the Laboratory and Drawing Office.
Applications, with *copies* of recent Testimonials, to R. O. PATERSON, Gas-Works, CHELTENHAM.

STOKER wanted, by a small Gas Company near London. Must be used to Boiler and Engine, and have a good character. Good Wages.
Apply, by letter, to No. 2506, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Foreman for a small Country Gas-Works. Will be expected to make himself useful in any way required.
Apply, by letter, with *copies* of Testimonials, to F. HAZELDINE, Esq., Barnfield, Blindley Heath, SURREY.

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WANTED, by the above Company, a thoroughly qualified man as METER INSPECTOR and REPAIRER. Wages 30s. per week.
Applications, accompanied by three Testimonials of recent date, to be sent to the undersigned on or before Saturday, the 27th inst.

W. A. WALKER,
Manager.

ASSISTANT SECRETARY.

A PROVINCIAL Gas Company in the South of England require the services of a gentleman as ASSISTANT SECRETARY. He must possess energy, tact, and ability; be a good Accountant, and well versed in the Secretarial Duties of a Company's Office. Salary to commence at £250, rising by increments of £20 per annum to £850.
Applicants are requested to state Age, whether Married or Single, where Experience acquired, and present Employment.
Testimonials will not be required in the first instance; but applicants should give the names of those to whom they will be prepared to refer.
Apply, by letter, not later than the 6th of May next, to No. 2511, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a small Gasholder, about 4 feet diameter, with Wrought-Iron Tank.
Write Price and Particulars to P. P. L. Co., 38, Leadenhall Street, LONDON, E.C.

WANTED, in really good condition, two or three PURIFIERS, about 12 feet square, with or without Connections.
State lowest cash price to No. 2509, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, cheap—One 20,000 cub. feet per hour Beale's EXHAUSTER, with two 8-inch Disc Valves. Also one to pass 5000 Cubic Feet per hour. Both in perfect condition.
Apply to SAMUEL WHILE, 60, Queen Victoria Street, LONDON, E.C.

FOR SALE—Two second-hand Purifiers. Size, 10 ft. by 5 ft. by 8 ft. deep, inside measurements, with Covers and Wood Grids, by Dempster, of Elland, complete.
For further Particulars, apply to the SECRETARY, Gas-Works, BRECON.

BARRY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the surplus TAR produced at their Gas-Works for One Year ending March 31, 1896.
Approximate quantity, 35,000 to 40,000 gallons.
The Tar will be pumped into Contractor's Tank-Trucks at the Gas-Works Siding.
Tenders, endorsed "Tender for Tar," stating price per ton, &c., to be addressed to the Chairman of the Gas and Water Committee, on or before the 28th inst.
The Committee do not bind themselves to accept the lowest or any tender.
Gas-Works, Barry, Glamorgan,
April 10, 1895.

CONSETT WATER-WORKS.
CONTRACT No. 1.

THE Directors of the Consett Water-Works Company are prepared to receive TENDERS for the construction of Four Covered FILTER-BEDS (each 125 feet long by 80 feet wide), a PURE-WATER TANK, Two COTTAGES, and other WORKS connected therewith, to be constructed on the Property of the Company at Honey Hill, in the Parish of Muggleswick, in the County of Durham, and situate about 4 miles from Consett and about 1 mile from Waskerley.
Drawings may be inspected, and Specification and Form of Tender and Schedule of Quantities may be obtained (on payment of Two Guineas, returnable if a *bonâ-fide* tender be made), on application at the Office of the Company at Consett, and at the Office of Messrs. T. & C. Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after Tuesday, the 23rd of April; and tenders must be delivered at the Water-Works Office, Consett, at or before Noon on Wednesday, the 8th of May next.
The Company do not pledge themselves to accept the lowest or other tender.

By order,
ALEXANDER RUSSELL, jun.,
Secretary.

Consett, April 9, 1895.

DUNFERMLINE GASLIGHT COMPANY, LIMITED.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company are prepared to receive OFFERS for the TAR and AMMONIACAL LIQUOR, to be produced in their Works for Twelve Months commencing June 1, 1895.
Tenders, to be endorsed "Tar and Liquor," must be delivered at my Office, on or before April 24, 1895.

HUBERT POOLEY, Assoc.M.Inst.C.E.,
Secretary.

Gas-Works, Dunfermline,
April 11, 1895.

DUNFERMLINE GASLIGHT COMPANY, LIMITED.

TENDERS FOR COAL AND CANNEL.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 4700 tons of CANNEL and 3000 tons of COAL suitable for Gas Making for delivery at their Railway Siding, Dunfermline, for One Year from June 1, 1895.
Tenders, to be endorsed "Coals," must be delivered at my Office on or before April 24, 1895.

HUBERT POOLEY, Assoc.M.Inst.C.E.,
Secretary.

Gas-Works, Dunfermline,
April 11, 1895.

RAMSBOTTOM GAS COMPANY.

TO IRONFOUNDERS AND OTHERS.

THE Directors of the Ramsbottom Gas Company invite TENDERS for the TAKING DOWN of the present ROOF over their Retort-House and Coal-Store, and the MAKING, ERECTION, and COMPLETION of a NEW ONE for same.
Further Information, &c., can be had on application to the undersigned.
Sealed tenders, addressed to the Chairman of the Company, and endorsed "Tender for Roof," to be sent in on or before Wednesday, the 24th inst.

JOS. C. INGHAM,
Manager.

Gas-Works, Stubbins,
April 10, 1895.

TENDERS FOR GAS COAL.

THE Brentwood Gas and Coke Company invite TENDERS for the supply of about 4000 tons of screened GAS COAL in Trucks at Brentwood Railway Station (G.E.R.), at per ton, to be delivered in the following quantities the second week of each month: June, 140 tons; July, 160 tons; August, 200 tons; September, 400 tons; October, 450 tons; November, 500 tons; December, 560 tons; January, 500 tons; February, 350 tons; March, 300 tons; April, 250 tons; May, 190 tons.
Tenders (with Analysis of the Coal to be supplied), and Terms for monthly payments, to be sent to the undersigned, on or before the 30th inst.
The Directors do not bind themselves to accept the lowest or any tender.

C. A. FIELDER,
Secretary.

Brentwood, Essex,
April 13, 1895.

TENDERS FOR COAL.

THE Directors of the Enniskillen Gas Company invite TENDERS for the supply of large double-screened GAS COAL, for One or Three Years, at the rate of 1350 tons a year, in lots of 450 tons, to be delivered the second week in March, second week in July, and last week in October each year (the first lot to be delivered October, 1895), free from all liability, to the Gas Company at Enniskillen Stations. Must leave a good Coke, and work out, in practical working, near 10,000 cubic feet per ton of 16-candle Gas.
Payments one month after delivery, as per weight over the Gas Company's Weigh-bridge.
Tenders to be sent in to me by the 30th day of April, 1895.
For further Particulars, apply to

JAMES MALAM,
Chairman.

21, Sefton Street, Southport.

GLASGOW CORPORATION GAS.

TENDERS FOR GASHOLDER.

THE Committee on Gas Supply and Electric Lighting of the Glasgow Corporation invite TENDERS for the construction of a GAS-HOLDER, 216 feet diameter, at their Tradeston Gas-Works.
Plans may be seen, and Form of Tender and copy of Specification obtained, at the Engineer's Office, 45, John Street, Glasgow, on payment of Two Guineas.
Sealed offers, marked "Tender for Gasholder," to be addressed to the Subscriber, and lodged with him on or before Tuesday, the 23rd current.
The Committee do not bind themselves to accept the lowest or any tender.

J. D. MARWICK,
Town Clerk.

City Chambers, George Square, Glasgow,
April 4, 1895.

COUNTY BOROUGH OF BURNLEY.

TO TAR DISTILLERS.

THE Gas Committee of the Corporation of Burnley invite TENDERS for the purchase of the TAR produced at their Gas-Works during the Twelve Months ending March 25, 1896.
Approximate quantity produced, 3000 tons.
The Tar will be delivered into the Contractor's Boats at the Gas-Works Wharf on the Leeds and Liverpool Canal.
Tenders, under seal, endorsed "Tender for Tar," stating price per ton, to be sent in, addressed to the Chairman of the Gas Committee, Town Clerk's Office, Burnley, on or before Wednesday, the 24th of April, 1895.

By order,
JNO. P. LEATHER,
Gas Engineer.

Gas-Works, Burnley,
April 5, 1895.

COUNTY BOROUGH OF BURY.

THE Gas Committee of the Corporation of Bury are open to receive TENDERS for the supply of 250 tons of OXIDE OF IRON for Gas Purification, to be delivered free, at the Gas Siding, Bury.
Full Particulars and Form of Tender may be had on application to Mr. W. H. S. Gendall, Engineer and Manager, Gas-Works, Bury.
Sealed tenders, endorsed "Tender for Oxide of Iron," to be sent to me, the undersigned, on or before Monday, April 22, 1895.
Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
April 6, 1895.

COUNTY BOROUGH OF BURY.

TO SULPHURIC ACID MAKERS.

THE Gas Committee of the Bury Corporation are prepared to receive TENDERS for the supply of about 300 tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia for a period of One Year from the 1st of May, 1895.
Forms of Tender and Conditions may be obtained on application to Mr. W. H. S. Gendall, Engineer and Manager, Gas-Works, Elton, Bury.
Sealed tenders, endorsed "Tender for Acid," to be sent to me, the undersigned, on or before Monday, April 22, 1895.
Preference will be given to those persons or firms who pay to their workpeople the regular standard rate of wages obtaining at the time in the town or district.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
April 6, 1895.

COMMERCIAL GAS COMPANY.

THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works for the Twelve Months ending the 30th of April, 1896.
The quantities are estimated to be as under, but the same cannot be guaranteed, and may be more or less—
At the Stepney Works, in the Regent's Canal.
3300 chaldrons (of 48 bushels) of Fine, and
3300 do. do. of Rough Breeze.
At the Poplar Works, in Bow Creek (free waterway).
3000 chaldrons (of 48 bushels) of Fine, and
3000 do. do. of Rough Breeze.
The tenders may be for the whole or for one or more Works separately.
The Contractors must give security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the contract.
The form of agreement to be signed can be seen at the Company's Offices.
Tenders, sealed and endorsed "Tender for Breeze," to be delivered here not later than the 24th of April inst.
The Directors reserve to themselves the right to accept any tender in part or in whole, and do not bind themselves to accept the highest or any tender.
Commercial Gas-Works, Stepney, E.,
April 10, 1895.

FARNHAM GAS COMPANY, LIMITED.

TENDERS FOR COAL.

THE Directors of the Farnham Gas Company, Limited, are prepared to receive TENDERS from Persons willing to supply and deliver, free of all Dues and Charges, at the Farnham Station, London and South-Western Railway, 2000 tons of the following descriptions of GAS COAL—viz., New Pelton, Pelaw Main, Aldwarke Main, or Strafford Silkstone—to be delivered in quantities of 50 tons (at intervals) before the 31st of March, 1896. The Coals to be consigned to the order of the Farnham Gas Company, Limited, at the Farnham Railway Station.
In the case of Seaborne Coal, the Meter's Certificate of each quantity to be duly sent with Invoice of same.
Payment monthly.
Sealed tenders, marked "Tender for Coal," to be delivered to the Secretary, Mr. W. Wells, 112, West Street, Farnham, Surrey, not later than Eleven o'clock a.m., on Monday, the 6th of May, *of whom Forms of Tender may be obtained.*
The Directors reserve the right to reject the lowest or any tender.
April 10, 1895.

TO BE SOLD by Tender, pursuant to an order of Mr. Justice Kekewich, made in an action, *Pasley v. The Wenham Company, Limited*, 1893, p. 3082, and dated the 11th of December, 1894, in one or more lots, the EXTENSIVE AND WELL-KNOWN BUSINESS OF LAMP MANUFACTURERS, GAS-FITTERS, AND STOVE MAKERS, carried on for many years by the Wenham Company, Limited, and their Predecessors, and now being carried on by the Receiver and Manager, and the various PATENTS for the United Kingdom and other Countries, STOCK-IN-TRADE, MACHINERY, PLANT, FIXTURES, and UTENSILS, and the LEASEHOLD PREMISES in Upper Ogle Street, Fitzroy Square, London, and Rue Coustou, Paris.
Tenders for the whole Property, in one lot or more lots, must be sent in, under cover, to Mr. Ernest Cooper (Messrs. Cooper Bros.), 14, George Street, Mansion House, London, E.C., not later than the 11th day of May, 1895; and on the 15th day of May, 1895, at Twelve o'clock at Noon, the Chief Clerk of the said Judge will declare who is or are the purchaser or purchasers.
Particulars and Conditions of Sale and Form of Tender, and Particulars of the Plant and Stock-in-Trade may be obtained gratis on application to the said Messrs. Cooper Bros. & Co., 14, George Street, Mansion House, E.C.; Messrs. Farebrother, Ellis, Clark, & Co., Surveyors and Auctioneers, 29, Fleet Street, Temple Bar, or 18, Old Broad Street, E.C.; Messrs. Clarke, Rawlins, & Co., 66, Gresham House, Old Broad Street, E.C., Solicitors; and to Messrs. Drake, Son, & Parton, 24, Rood Lane, E.C., Plaintiff's Solicitors.
Dated this 10th day of April, 1895.

RICHARD JOHN VILLIERS,
Chief Clerk.

HEBDEN BRIDGE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works.

Further Particulars can be obtained from the undersigned, to whom endorsed tenders must be sent on or before Saturday, May 11, 1895.

ROBERT WEST,
Secretary and Manager.

TENDERS FOR CONDENSER.

THE Directors of the Tynemouth Gas Company are prepared to receive TENDERS for the Construction of an ANNULAR CONDENSER at their Works.

Plans and Specification can be seen on application.

The Directors do not agree to accept the lowest or any tender.

Sealed tenders to be forwarded to the undersigned on or before the 30th inst.

W. HARDIE, jun.,
Engineer.

Gas-Works, North Shields,
April 11, 1895.

THE Widnes Corporation invite Tenders for the supply of about 20,000 tons of GAS COAL (slack, "through and through," or screened Coal), for the period ending the 30th of June, 1896, to be delivered at the Gas-Works, Widnes.

Conditions and Forms of Tender may be obtained from Mr. Isaac Carr, Assoc.M.Inst.C.E., Gas Engineer, Widnes.

Tenders, endorsed "Gas Coal," to be delivered to the undersigned on or before the 4th of May prox.

The lowest or any tender not necessarily accepted.

H. S. OPPENHEIM,
Town Clerk.

Town Hall, Widnes,
April 11, 1895.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO TAR AND LIQUOR DISTILLERS.

THE Directors of the above Company are prepared to receive TENDERS for the surplus TAR and LIQUOR produced by the above Company for the Year ending June 30, 1896.

Coal carbonized, about 10,000 tons per annum.

All tenders to state the price per cask of 40 gallons, and in matter of Liquor to state the price per ounce strength by the distillation test.

Cartage to and from Railway Station, Guildford, free. All empties to be provided by the Contractor.

Tenders, endorsed "Tar and Liquor," to be sent to Mark Smallpeice, Esq., Chairman of the Gas Company, Guildford, on or before Wednesday, May 8, 1895.

By order,
R. T. SIMPSON,
Secretary.

Gas Offices, Guildford,
April 9, 1895.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO COAL MERCHANTS.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 20,000 to 22,000 tons of GAS COAL, to be delivered free at Guildford Station during the period of Two Years from July 1, 1895, to June 30, 1897, in such quantities and at such times as required.

The Directors reserve the right to accept the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any tender.

Tenders, to state the name of the Coal offered, to be endorsed "Tender for Coal," and to be sent to Mark Smallpeice, Esq., Chairman of the Company, Guildford, on or before Wednesday, May 8, 1895.

Cannel need not be tendered for.

By order,
R. T. SIMPSON,
Secretary.

Gas Offices, Guildford,
April 9, 1895.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the Hornsey Gas Company offer FOR SALE BY TENDER £10,000 "D" (Additional Capital) STOCK; being the second portion of the £30,000 additional Capital authorized to be raised by Resolution passed at the Extraordinary General Meeting of Proprietors held on the 17th day of February, 1893, in pursuance of the Hornsey Gas Order, 1884, and that they will be prepared to receive sealed TENDERS for such Stock not later than Twelve o'clock noon, on Wednesday, the 15th day of May, 1895.

The amount to be allotted thereon must be paid up in full on or before the 29th day of June, 1895.

The Interest on the Stock will be calculated half yearly up to the 31st of December and the 30th of June in each Year, and be paid by warrants issued immediately following the Half-Yearly Meetings of the Company, usually in March and August respectively in each Year.

A deposit of £10 per cent. of the nominal amount of the Stock tendered for must accompany each tender.

Any amount, not being less than £10 or a multiple thereof, may be tendered for; and the Stock will be registered in the Company's Books in the names of the allottees or their nominees free of expense.

The minimum price below which no tender will be accepted has been fixed at One Hundred and Thirty-Eight Pounds Sterling (£138) for each One Hundred Pounds of Stock.

Particulars and Conditions of Sale, with printed Form of Tender attached thereto (upon which form only tenders will be received), may be obtained at the Company's Offices, No. 63, Chancery Lane, W.C., between the hours of Ten o'clock a.m., and Four o'clock p.m.

By order,
(Signed) S. J. WILLIAMS,
Secretary.

Offices: 63, Chancery Lane, W.C.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Victoria New-market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the ensuing Twelve Months ending the 25th of March, 1896.

Tenders, stating price per 1000 gallons, in Contractor's Tanks or Barrels, free on Rail at Newmarket, to be sent on or before the 25th of April, to the undersigned, from whom any further particulars may be obtained.

The Directors do not bind themselves to accept the highest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
April 3, 1895.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that an Ex-TRAORDINARY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 25th day of April, 1895, at Six o'clock precisely, at which a Resolution will be submitted authorizing the Directors, under the Provisions of the Bromley Gas Act, 1879, to raise the whole of the money which the Company have already raised, or are authorized to raise, on Mortgage, by the creation and issue at such times, in such amounts and manner, on such terms, subject to such conditions, and with such rights and privileges, as the Directors for the time being may think fit, of Stock, to be called Debenture Stock, instead of such money so already raised, or authorized to be raised by Mortgage; such stock to bear a Perpetual Preferential Interest of £3 10s. per cent. per annum, payable half yearly, commencing from the date of the issue from time to time of such Debenture Stock.

By order,
H. W. AMOS,
Secretary.

Gas-Works, Bromley, Kent,
April 9, 1895.

PATENTS, DESIGNS, AND TRADE MARKS ACTS, 1883 TO 1888.

NOTICE is Hereby Given, that Charles GRANTLEY BEECHEY, of 7, Kremlin Drive, Liverpool, County Lancaster, has APPLIED FOR LEAVE TO AMEND THE SPECIFICATION of the Letters Patent No. 16,459 of 1891, for "Improvements in, or connected with, Gas-Meters."

Particulars of the proposed Amendments were set forth in the "Illustrated Official Journal (Patents)," issued on the 3rd of April, 1895.

Any person, or persons, may give notice of opposition to the Amendment (on Form G), at the Patent Office, 25, Southampton Buildings, London, W.C., within One Calendar Month from the date of the said "Journal."

(Signed) H. READER LACK,
Comptroller-General.

Cheesbrough and Royston,
Patent Agents,
15, Water Street, Liverpool.

NOTICE.

WHEREAS it has come to the know-ledge of the INCANDESCENT GAS-LIGHT COMPANY, Limited, of Palmer Street, Westminster, that a Company is being promoted for the purpose of USING and SELLING a FORM of INCANDESCENT GAS LIGHTING APPARATUS, called the "DE MARE SYSTEM," and that the Office at which this Company is being promoted and the lighting apparatus exhibited is 34, Victoria Street, Westminster, S.W.—This is to Give Notice, that the operations of this Company and of the persons concerned in its promotion, constitute a direct INFRINGEMENT of the INCANDESCENT GAS-LIGHT COMPANY'S PATENTS; that an action will immediately be brought against all persons known to be concerned in such promotion and exhibition, to restrain such Infringement and Threatened Infringement.

The Incandescent Gas-Light Company, Limited, are determined at any cost to put a stop to the Infringement of their Patents; and actions will be brought without further notice against all persons found dealing in, or using, the apparatus sold or supplied by the afore-mentioned proposed Company, or the persons promoting the same.

(Signed) FAITHFULL AND OWEN,
Solicitors to the Incandescent Gas-Light Company, Limited.

11, Victoria Street, S.W.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

MESSRS. CLAPHAM BROS., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture my CONDENSER and WASHER-SCRUBBERS.

The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.

These Appliances can now be obtained solely of the undersigned.

Winchester House, London, E.C. J. A. KELMAN.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

CLAPHAM BROS., LIMITED, of Keighley, Yorks., beg to intimate that they are the SOLE MAKERS of LAYCOCK & CLAPHAM'S "ECLIPSE" WASHER-SCRUBBER, and that no person or persons beyond the Patentees and Makers have ever had any interest whatever in the Patent.

They are also the SOLE MAKERS of CLAPHAM'S PATENT IMPROVED "ECLIPSE" CONDENSER, as supplied to Bradford, Manchester, and other Gas-Works.

Orders and Inquiries promptly attended to. See Advertisement in this week's JOURNAL, p. 824.

In Paper Cover, Price 1s.

GASHOLDERS
WITH OR WITHOUT
GUIDE-FRAMING.

A Discussion between E. LLOYD PEASE and F. SOUTHWELL CRIPPS.

To which is added a Synopsis of

LITERATURE ON GASHOLDER CONSTRUCTION,

Containing references to all the Literature (English and Foreign) on Reducing or Abolishing the Guide-Framing of Gasholders, also the principal Literature on Gasholder Construction generally, compiled to March, 1893; with a List of all the English and Foreign Periodicals connected with the Gas Industry.

COMPILED BY

F. SOUTHWELL CRIPPS,

Associate Member of the Institution of Civil Engineers; Fellow of the Imperial Institute; Member of the Institution of Gas Engineers; Member of the Society of Arts

AUTHOR OF

"The Guide-Framing of Gasholders and Strains in Structures Connected with Gas-Works;"
"The Flow of Gases and Proportioning Gas-Mains," &c.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

HARCOURT'S COLOUR TEST.

For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.

The Materials for the above Tests may be obtained from

Mr. S. E. MILLER, 115, Cowley Road, Oxford.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS:—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE, 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

TO EMPLOYERS, COMPANY DIRECTORS, ETC.

The LAW GUARANTEE & TRUST SOCIETY,
LIMITED,
GUARANTEES FIDELITY.

Send for complete Prospectus, containing Balance-Sheet, Copy of Policy, &c., &c.

HEAD OFFICE:
49, CHANCERY LANE, LONDON, W.C.

LOW MOOR BLACK BED
GAS COAL.

YIELD OF GAS PER TON · 10,375 CUBIC FEET.
ILLUMINATING POWER · 17·50 SPERM CANDLES.
COKE · · · · · · 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to
GEORGE & JOHN HAIGH,
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO.,
Central Plumbing Works, Town Hall Square, BOLTON.

Practical Makers of all kinds of Saturators, and Specialists in every description of Lead Work required in connection with Sulphate Plants.

Special attention to Repairs.

Improved Lead-Burning Machines, Sulphate Bagging Machines, Copper Scoops, &c.

HIGHEST REFERENCES ON APPLICATION.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

ALEXANDER CAMERON,
CANNEL & GAS COAL MERCHANT,
48, WEST REGENT STREET, GLASGOW.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

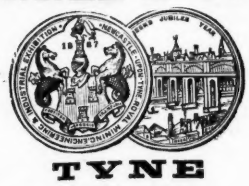
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.
IRONFOUNDERS,
MIDDLESBROUGH.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.



TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 Cubic Feet per ton of Coal; and Illuminating Power nearly 17½ Candles.

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham:—

Specific Gravity (Water 1). .	1·276
Weight of One Cubic Foot. .	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter.	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal .	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal . . .	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham,
8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co LIMITED,

BARNSLEY;

Or to Mr. W. H. HARVEY,

17, Old Queen Street, Westminster, S.W.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

ALFRED WILLIAMS & Co (MATTHEW MILDRED)

71, 72 & 73, BANKSIDE,

SOUTHWARK, S.E.

UNIVERSAL PROVIDERS FOR GAS, WATER & SEWAGE WORKS

ENGINEERS & CONTRACTORS

FOR THE ERECTION OF COMPLETE GAS AND WATER WORKS, AND FOR RENEWALS AND EXTENSIONS OF EVERY DESCRIPTION.

PLANS & ESTIMATES ON APPLICATION.

MAIN LAYING AND RETORT SETTING.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

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The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

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Tudhoe Gas-Works,
Spennymoor,
8th June, 1895.

Messrs. The

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Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, 17 Sperm Candles.
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

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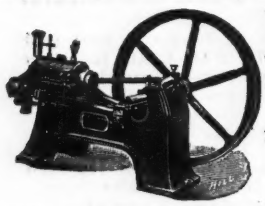

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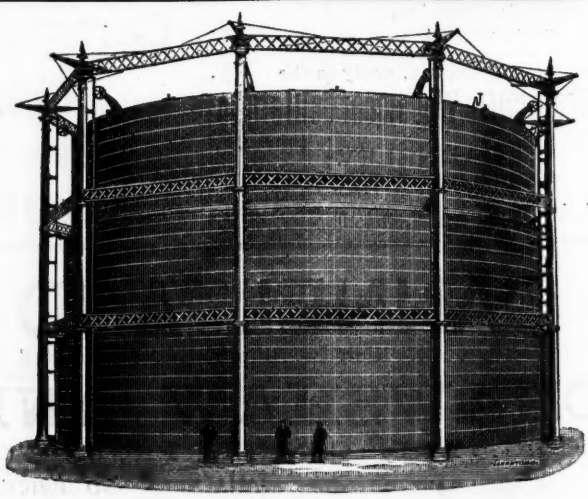

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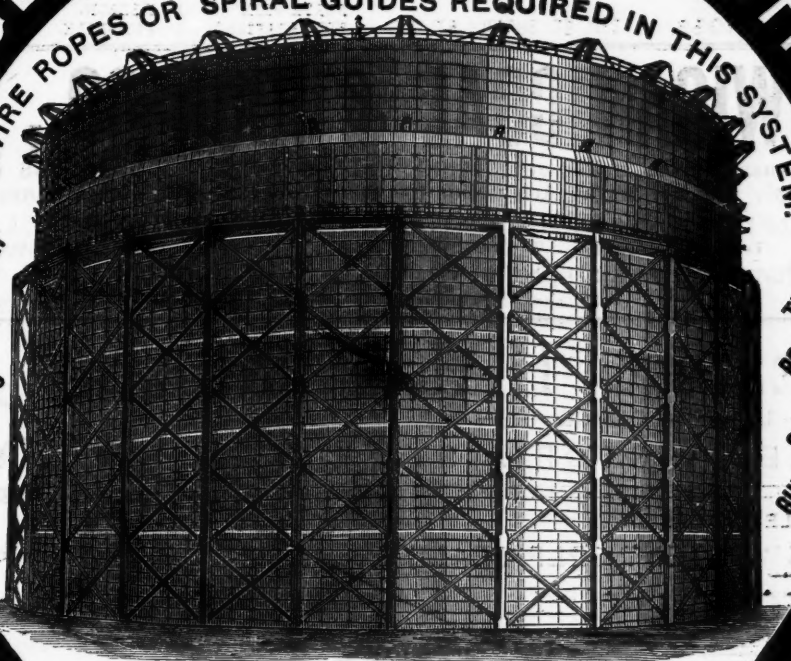

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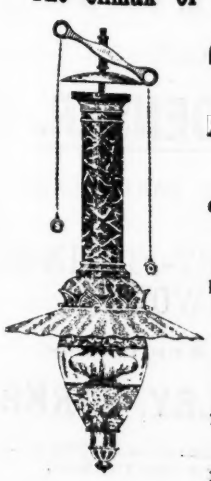

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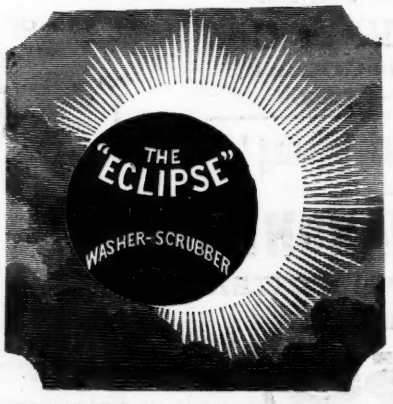

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